



REPORT OF THE JOINT COMMITTEE ON REINFORCED CONCRETE.

Adopted at the General Meeting of the Royal Institute of British Architects, Monday, 27th May 1907.

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	<i>Representing the Institute of Builders</i>
	<i>Representing the Municipal and County Engineers' Association</i>
	<i>Representing the War Office</i>
	<i>Representing the Admiralty</i>

PREFATORY REMARKS BY SIR HENRY TANNER, I.S.O. [F.], CHAIRMAN.

THE Committee on Reinforced Concrete, over which I had the honour to preside, was formed on the recommendation of the Science Standing Committee of the Institute, which recommendation was adopted by the Council in October 1905.

In forming the Committee the Institute very wisely decided that other bodies to whom reinforced concrete was of interest should be invited to take part in the work, and thus ensure that the Report and Rules which might be prepared should be considered from all points of view. The Admiralty, War Office, Municipal and County Surveyors, District Surveyors, and the Institute of Builders were all represented, as well as the Royal Institute of British Architects.

The reference to the Committee was in the following terms: "To draw up Rules for the guidance of architects for the use of reinforced concrete." The result of the Committee's deliberations will be found in the Provisional Report which has been issued to members [see page 515], and which we hope you will adopt to-night.

There has not been hitherto in this country any authoritative pronouncement on the necessary rules to be observed in such construction. In many ways this has prevented the

employment of reinforced concrete, such employment being practically prohibited for complete buildings under the ordinary building rules and regulations ; and it is only those bodies who are free from these restrictions, such as railway and dock companies, who have been able to avail themselves of so economical and space-saving a method of construction, and on these points I speak from experience. Other countries have been more lenient, and in consequence those countries are far in advance of this, both as to general knowledge of the material and skill in its use. However, we hope that, if the Meeting adopts the rules which have been prepared, this country may not for long occupy the backward position that it now does.

It was found desirable to form Sub-Committees for the consideration of special branches of the subject. These were three in number : (1) Fire Resistance, Mr. T. H. Watson, Chairman ; (2) Materials, Col. Mayne, R.E., Chairman ; and (3) Formulae, Professor Unwin, Chairman.

These Committees had to consider an enormous mass of literature, including the regulations in force in other countries, and only those who have studied the subject are aware of the innumerable experiments, theories, writings, and reports of discussions which are available.

To begin with, Messrs. Cubitt kindly put at the disposal of the Committee seventeen beams, plain and reinforced, for testing to destruction, the direction of the tests being undertaken by Professor Unwin. These were the only tests made under the supervision of the Committee, it being found that the available records of all kinds of accurately tabulated tests by various public authorities, technical colleges, and other bodies had largely removed the material from the unknown, and that what was required was rather a reasoned theory based on the recorded experiments than on a further series of experiments of our own, the latter, indeed, being beyond the means at our command. There are, of course, various disputed points which must be settled by further experiment, such as the width of flange in T-beams ; but to them the Report draws attention without laying down definite rules.

The aim of the Committee has been the production of a good working guide, the laying down of the necessary conditions and settling safe rules for a proper disposition of the parts. Hitherto every specialist in this country has made his own rules, perhaps more or less approximately accurate, but the margin of safety has been occasionally cut too fine. It should not be enough that a structure bears its working load without apparent distress, because a specially well-made floor may stand loads far beyond the average without breaking down ; but we have to provide such a margin of safety as will cover ordinary inattention or ordinary defects of workmanship.

The difficulty has been to determine the merits of rival systems, each specialist naturally regarding his own system as the best ; but the Report and Rules which are now before you will enable an accurate judgment to be arrived at by the architect himself, if he has the requisite knowledge, or with the aid of a consulting engineer if he prefers.

The Rules proposed are by no means revolutionary, and the same principles are being adopted abroad but with some variation of detail. They can be adopted as the basis upon which tenders may be obtained, and so ensure that these shall be prepared on equal terms ; and it is hoped they will be of considerable service in placing building construction of this type upon a recognised footing, and serve to explode the idea that there is anything of an occult nature connected with the necessary calculations.

For some fifty years past, viz. from the date of Wilkinson's patent in 1854, the attention of many men has been directed to improving the theory and adding to the practice of building in concrete reinforced in various ways, and it cannot be said that the present state of knowledge is due to the efforts of any one man. Special skill is of course needed owing to the limited practice, but in the preparation of our Report a preference for any feature which is claimed as patent has been avoided ; therefore special forms of bar or peculiar arrangements

are not referred to, and we have confined ourselves to the laying down of principles for all kinds of structures reinforced with ordinary bars.

The Report itself, although short, is the result of many lengthy discussions and investigations. It is not claimed to be final, but simply a reasonable guide in the present state of knowledge.

I do not propose to trouble you with any explanations of the Report, or of the means which led to the conclusions stated therein, because the Report has now been in your hands for some time; and in view of the interest which is at present being taken in the subject, explanations will no doubt be asked for, and members of our Sub-Committees will have the opportunity of replying to such queries.

Without further preface, therefore, I beg to formally move the adoption of the Report, and that copies, with explanatory letters, be sent to the Local Government Board and the London County Council.

REPORT OF THE COMMITTEE.

1. Reinforced concrete is used so much in building and engineering construction that a general agreement on the essential requirements of good work is desirable. The proposals which follow are intended to embody these essentials, and to apply generally to all systems of reinforcement.

Good workmanship and materials are essential in reinforced concrete. With these and good design structures of this kind appear to be trustworthy. It is essential that the workmen employed should be skilled in this class of construction. Very careful superintendence is required during the execution of the work in regard to—

- (a) The quality, testing, and mixing of the materials.
- (b) The sizes and positions of the reinforcements.
- (c) The construction and removal of centering.
- (d) The laying of the material in place and the thorough punning of the concrete to ensure solidity and freedom from voids.

If the metal skeleton be properly coated with cement, and the concrete be solid and free from voids, there is no reason to fear decay of the reinforcement in concrete of stone, gravel, cinder, coke-breeze, &c., made with clean fresh water.

2. The By-laws regulating building in this country require external walls to be in brick, or stone, or concrete of certain specified thicknesses. In some places it is in the power of the local authorities to permit a reduced thickness of concrete when it is strengthened by metal; in other districts no such power has been retained. We are of opinion that all By-laws should be so altered as to expressly include reinforced concrete amongst the recognised forms of construction.

A section should be added to the By-laws declaring that when it is desired to erect buildings in reinforced concrete complete drawings showing all details of construction and the sizes and positions of reinforcing bars, a specification of the materials to be used and proportions of the concrete, and the necessary calculations of strength based on the rules contained in this Report, signed by the person or persons responsible for the design and execution of the work, shall be lodged with the local authority.

3. FIRE RESISTANCE.—(a) Floors, walls, and other constructions in steel and concrete formed of incombustible materials prevent the spread of fire in varying degrees according to the composition of the concrete, the thickness of the parts, and the amount of cover given to the metal.

(b) Experiment and actual experience of fires show that concrete in which limestone is used for the aggregate is disintegrated, crumbles and loses coherence when subjected to very fierce fires, and that concretes of gravel or sandstones also suffer, but in a rather less degree.* The metal reinforcement in such cases generally retains the mass in position, but the strength of the part is so much diminished that it must be renewed. Concrete in which coke-breeze, cinders, or slag forms the aggregate is only superficially injured, does not lose its strength, and in general may be repaired. Concrete of broken brick suffers more than cinder concrete and less than gravel or stone concrete.

(c) The material to be used in any given case should be governed by the amount of fire resistance required as well as by the cheapness of, or the facility of procuring, the aggregate.

(d) Rigidly attached web members, loose stirrups, bent-up rods, or similar means of connecting the metal in the lower or tension sides of beams or floor slabs (which sides suffer most injury in case of fire) with the upper or compression sides of beams or slabs not usually injured are very desirable.

(e) For main beams a covering of $1\frac{1}{2}$ inch to 2 inches of concrete over the metal reinforcement appears from experience in actual fires to afford ample protection to the structural parts. In floor slabs the cover required may be reduced to 1 inch. All angles should be rounded or splayed to prevent spalling off under heat.

(f) More perfect protection to the structure is required under very high temperature, and in the most severe conditions it is desirable to cover the concrete structure with fire-resisting plastering which may be easily renewed. Columns may be covered with coke-breeze concrete, terra-cotta, or other fire-resisting facing.

MATERIALS.

4. *Cement.*—Only Portland cement complying with the requirements of the specification adopted by the British Engineering Standards Committee should be employed; in general the slow-setting quality should be used. Every lot of cement delivered should be tested, and in addition the tests for soundness and time of setting, which can be made without expensive apparatus, should be applied frequently during construction. The cement should be delivered on the work in bags or barrels bearing the maker's name and the weight of the cement contained.

5. *Sand.*—The sand should be composed of hard grains of various sizes up to particles which will pass a quarter-inch square mesh, but of which at least 75 per cent. should pass $\frac{1}{8}$ -inch square mesh. Fine sand alone is not so suitable, but the finer the sand the greater is the quantity of cement required for equal strength of mortar. It should be clean and free from ligneous, organic, or earthy matter. The value of a sand cannot always be judged from its appearance, and tests of the mortar prepared with the cement and the sand proposed should always be made. Washing sand does not always improve it, as the finer particles which may be of value to the compactness and solidity of the mortar are carried away in the process.

6. *Aggregate.*—The aggregate, consisting of gravel, hard stone, or other suitable material, should be clean and angular, varied in size as much as possible between the limits of size allowed for the work. In all cases material which passes a sieve of a quarter-inch square

* The smaller the aggregate the less the injury.

mesh should be reckoned as sand. The maximum allowable size is usually $\frac{3}{8}$ inch. The maximum limit must always be such that the aggregate can pass between the reinforcing bars and between these and the centering. The sand should be separated from the gravel or broken stone by screening before the materials are measured.

7. *Proportions of the Concrete.*—In all cases the proportions of the cement, sand, and aggregate should be separately specified in volumes.

As the strength and durability of reinforced concrete structures depend mostly on the concrete being properly proportioned, it is desirable that in all important cases tests should be made as described herein with the actual materials that will be used in the work before the detailed designs for the work are prepared.

In no case should less dry cement be added to the cement when dry than will suffice to fill its interstices, but subject to that the proportions of the sand and cement should be settled with reference to the strength required, and the volume of mortar produced by the admixture of sand and cement in the proportions arranged should be ascertained.*

The interstices in the aggregate should be measured and at least sufficient mortar allowed to each volume of aggregate to fill the interstices and leave at least 10 per cent. surplus.

For ordinary work a proportion of one part cement to two parts sand will be found to give a strong, practically watertight mortar, but where special watertightness or strength is required the proportion of cement must be increased.

The amount of cement added to the aggregate should be determined on the work by weight. The weight of a cubic foot of cement for the purpose of proportioning the amount of cement to be added may be taken at 90 lbs.

8. *Metal.*—The metal used should be steel having the following qualities:—

- (a) An ultimate strength of not less than 60,000 lbs. per square inch.
- (b) An elastic limit of not less than 50 per cent., or more than 60 per cent. of the ultimate.
- (c) An elongation of not less than 22 per cent. in the lengths stated below.
- (d) It must stand bending cold 180° to a diameter of the thickness of pieces tested without fracture on outside of bent portion.

In the case of round bars the elongation should not be less than 22 per cent., measured on a gauge-length of eight diameters. In the case of bars over one inch in diameter the elongation may be measured on a gauge-length of four diameters, and should then be not less than 27 per cent. For other sectional material the tensile and elongation tests should be those prescribed in the British Standard Specification for Structural Steel.

Before use in the work the metal must be clean and free from scale or loose rust. It should not be oiled or painted, but a wash of thick Portland cement grout is desirable.

Welding should in general be forbidden; if it is found necessary, it should be at points where the metal is least stressed, and it should never be allowed without the special sanction of the architect or engineer responsible for the design.

The reinforcement ought to be placed and kept exactly in the positions marked on the drawings, and, apart from any consideration of fire resistance, ought not to be nearer the surface of the concrete at any point than 1 inch in beams and $\frac{1}{2}$ inch in floor slabs or other thin structures.

* For convenience on small works the following figures may be taken as a guide, and are probably approximately correct for medium siliceous sand:—

Parts Cement	Parts Sand	Parts Mortar	Parts Cement	Parts Sand	Parts Mortar
1	$\frac{1}{2}$	= 1.20	1	2	= 2.55
1	1	= 1.50	1	$2\frac{1}{2}$	= 2.70
1	$1\frac{1}{2}$	= 1.90	1	3	= 3.00

9. *Mixing: General.*—In all cases the concrete should be mixed in small batches and in accurate proportions, and should be laid as rapidly as possible.

Hand-mixing.—When the materials are mixed by hand they are to be turned over and thoroughly mixed on a clean platform until the colour of the cement is uniformly distributed over the aggregate.

Machine-mixing.—Whenever practicable the concrete should be mixed by machinery.

10. *Laying.*—The thickness of loose concrete that is to be punned should not exceed three inches before punning, especially in the vicinity of the reinforcing metal. Special care is to be taken to ensure perfect contact between the concrete and the reinforcement, and the punning to be continued till the concrete is thoroughly consolidated. Each section of concreting should be as far as possible completed in one operation; when this is impracticable, and work has to be recommenced on a recently laid surface, it is necessary to wet the surface; and where it has hardened it must be hacked off, swept clean, and covered with cement grout. Work should not be carried on when the temperature is below 34° Fahr. The concrete when laid should be protected from the action of frost, and shielded against too rapid drying from exposure to the sun's rays or winds, and kept well wetted. All shaking and jarring must be avoided. The efficiency of the structure depends chiefly on the care with which the laying is done.

Water.—The amount of water to be added depends on the temperature at the time of mixing, the materials, and the state of these, and other factors, and no recommendation has therefore been made. Sea-water should not be used.

11. *Centering or Casing.*—The centering must be of such dimensions, and so constructed, as to remain rigid and unyielding during the laying and punning of the concrete. It must be so arranged as to permit of easing and removal without jarring the concrete. Provision should be made wherever practicable for splaying or rounding the angles of the concrete. Timber when used for centering may be advantageously limewashed before the concrete is deposited.

12. *Striking of Centres.*—The time during which the centres should remain up depends on various circumstances, such as the dimensions or thickness of the parts of the work, the amount of water used in mixing, the state of the weather during laying and setting, &c., and must be left to the judgment of the person responsible for the work. The casing for columns, for the sides of beams, and for the soffits of floor slabs not more than 4 feet span must not be removed under eight days; soffits of beams and of floors of greater span should remain up for at least fourteen days, and for large span arches for at least twenty-eight days. The centering of floors in buildings which are not loaded for some time after the removal of same may be removed in a short time; the centering for structures which are to be used as soon as completed must remain in place much longer. If frost occurs during setting, the time should be increased by the duration of the frost.

13. *Testing.*—Before the detailed designs for an important work are prepared, and during the execution of such a work, test pieces of concrete should be made from the cement, sand, and aggregate to be used in the work, mixed in the proportions specified. These pieces should be either cubes of not less than four inches each way, or cylinders not less than four inches diameter, and of a length not less than the diameter. They should be prepared in moulds, and punned as described for the work. Not less than four cubes or cylinders should be used for each test, which should be made twenty-eight days after moulding. The pieces should be tested by compression, the load being slowly and uniformly applied. The average of the results should be taken as the strength of the concrete for the purposes of calculation, and in the case of concrete made in proportions of 1 cement, 2 sand, 4 hard stone the strength should not be less than 2,400 lbs. per square inch.

Loading tests on the structure itself should not be made until at least two months have elapsed since the laying of the concrete. The test load should not exceed one and a half times the accidental load. Consideration must also be given to the action of the adjoining parts of the structure in cases of partial loading. In no case should any test load be allowed which would cause the stress in any part of the reinforcement to exceed two-thirds of that at which the steel reaches its elastic limit.

METHODS OF CALCULATION.

DATA.

1. Loads.—In designing any structure there must be taken into account :—

- (a) The weight of the structure.
- (b) Any other permanent load, such as flooring, plaster, &c.
- (c) The accidental load.*
- (d) In some cases also an allowance for vibration and shock.

Of all probable distributions of the load, that is to be assumed in calculation which will cause the greatest straining action.

(i.) The weight of the concrete and steel structure may be taken at 150 lbs. per cubic foot.

(ii.) In structures subjected to very varying loads and more or less vibration and shock, as, for instance, the floors of public halls, factories, or workshops, the allowance for shock may be taken equal to half the accidental load. In structures subjected to considerable vibration and shock, such as floors carrying machinery, the roofs of vaults under passage ways and courtyards, the allowance for shock may be taken equal to the accidental load.

(iii.) In the case of columns or piers in buildings, which support three or more floors, the load at different levels may be estimated in this way. For the part of the roof or top floor supported, the full accidental load assumed for the floor and roof is to be taken. For the next floor below the top floor 10 per cent. less than the accidental load assumed for that floor. For the next floor 20 per cent. less, and so on to the floor at which the reduction amounts to 50 per cent. of the assumed load on the floor. For all lower floors the accidental load on the columns may be taken at 50 per cent. of the loads assumed in calculating those floors.

BEAMS.

2. Spans.—These may be taken as follows :—For beams the distance from centre to centre of bearings. For slabs supported at the ends, the clear span + the thickness of slab. For slabs continuous over more than one span the distance from centre to centre of beams.

3. Bending moments.—In the most ordinary case of a uniformly distributed load of w lbs. per inch run of span the bending moments will be as follows :—

(a) Beam or slab simply supported at the ends. Greatest bending moment at centre of span of l inches is equal to $w l^2/8$ inch lbs.

(b) Beam continuous over several spans, or encastré or fixed in direction at each end. The greatest bending moments are at the ends of the span, and the beam should be reinforced at its upper side near the ends. If continuity can be perfectly relied on, the bending moment at the centre of the span is $w l^3/24$, and that over the supports $-w l^3/12$. If the continuity is in any way imperfect, the bending moment at the centre will in general be greater, and that

* By "accidental" load is meant the imposed load additional to the weight of the structure for which the structure is calculated.

at the supports less, but the case is a very indefinite one. It appears desirable that generally in building construction the centre bending moment should not be taken less than $w l^2/12$. The bending moment at the ends depends greatly on the fixedness of the ends in level and direction. When continuity and fixing of the ends, whether perfect or imperfect, is allowed for in determining the bending moment near the middle of the span, the beam or slab must be designed and reinforced to resist the corresponding bending moments at the ends. When the load is not uniformly distributed the bending moments must be calculated on the ordinary statical principles.

4. *Stresses.*—The internal stresses are determined, as in the case of a homogeneous beam, on these approximate assumptions :—

(a) The coefficient of elasticity in compression of stone or gravel concrete, not weaker than 1 : 2 : 4, is treated as constant and taken at one-fifteenth of the coefficient of elasticity of steel.

$$\begin{aligned} \text{Coefficient for concrete} &= E_c = 2,000,000 \text{ lbs. per sq. in.} \\ \text{,, steel} &= E_s = 30,000,000 \\ \frac{E_s}{E_c} &= 15. \end{aligned}$$

It follows that at any given distance from the neutral axis, the stress per square inch on steel will be fifteen times as great as on concrete.

(b) The resistance of concrete to tension is neglected, and the steel reinforcement is assumed to carry all the tension.

(c) The stress on the steel reinforcement is taken as uniform on a cross-section, and that on the concrete as uniformly varying.

5. *Working stresses.*—If the concrete is of such a quality that its crushing strength is 2,400 to 3,000 lbs. per square inch after twenty-eight days, and the steel has a tenacity of not less than 60,000 lbs. per square inch, the following stresses may be allowed :—

	lbs. per sq. in.
Concrete, in compression in beams subjected to bending 600
Concrete in columns under simple compression 500
Concrete in shear in beams 60
Adhesion * of concrete to metal 100
Steel in tension 15,000 to 17,000

When the proportions of the concrete differ from those stated above the stress in compression allowed in beams may be taken at one-fourth, and that in columns at one-fifth of the crushing stress of cubes of the concrete of sufficient size at twenty-eight days after gauging. If stronger steel is used than that stated above, the allowable tensile stress may be taken at one-half the stress at the yield point of the steel.

Approximate Calculations.

Let b be the width and d the effective depth of the beam in inches.

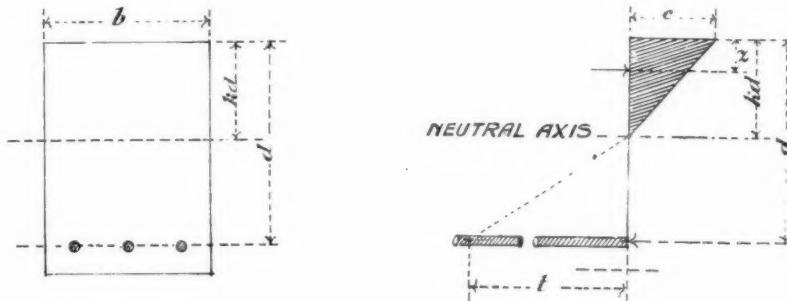
$A = bd$ the area of cross-section.

$m = E_s/E_c$ the ratio of the coefficients of elasticity of steel and concrete.

* It is desirable that the reinforcing rods should be so designed that the adhesion is sufficient to resist the shear between the metal and concrete. Precautions should in

every case be taken by splitting or bending the rod ends, or otherwise to provide additional security against the sliding of the rods in the concrete.

M = bending moment at the section considered, in inch-pound units.
 t = tensile stress in metal in lbs. per square inch.
 c = compressive stress in concrete per square inch.
 z = distance of resultant thrust in concrete from compressed edge of beam in inches.
 kd = distance of neutral axis from compressed edge in inches.
 $A_c = kbd$ = area of concrete in compression in square inches.
 A_t = area of metal in tension in square inches.
 $p = A_t/bd$ the ratio of section of metal to section of concrete.
 l = span in inches.
 w = load per inch run of span.



(a) Beams of Rectangular Section with Single Reinforcement.

In a homogeneous beam the stresses are proportional to the distances from the neutral axis. In a discrete beam, such as a beam of concrete and steel, on account of the greater rigidity of steel, at a given distance from the neutral axis the stress in the steel will be m times as great as in concrete. Hence—

$$\frac{mc}{t} = \frac{kd}{d(1-k)} = \frac{k}{1-k}$$

But equating the total tension and compression

$$\begin{aligned} \frac{1}{2} cbkd &= pbdt \\ ck &= 2pt. \end{aligned}$$

Replacing c in terms of t

$$\begin{aligned} \frac{k^2}{m(1-k)} &= 2p \\ k &= \sqrt{(p^2m^2 + 2pm)} - pm. \end{aligned}$$

Thus for

$m =$	$p =$	$k =$
15	.007	.365
15	.010	.417
15	.015	.483
15	.020	.530

That is, the neutral axis is lower as the amount of reinforcement is greater, and passes the half depth for 2 per cent. of reinforcement.

The distance of the resultant thrust from the compressed edge is $z = \frac{1}{3}kd$.

Equating the moments of resistance to the bending moment,

$$M = A_s t (d - \frac{1}{3}kd) = \frac{1}{2}A_s c (d - \frac{1}{3}kd)$$

$$t = \frac{M}{A_s d (1 - \frac{1}{3}k)} = \frac{M}{pbd^2 (1 - \frac{1}{3}k)}$$

$$c = \frac{2M}{A_s d (1 - \frac{1}{3}k)} = \frac{2M}{k b d^2 (1 - \frac{1}{3}k)}$$

The shearing stresses and tensions near the ends of the beam are usually resisted by stirrups or inclined steel bars, and it is always desirable to bend upwards near the supports one or more of the reinforcing bars when the reduced bending moments at the ends permit of so doing. Stirrups or rigidly attached web members or inclined bars should be provided in all cases where the average shearing stress on a vertical section of the beam exceeds 60 lbs. per square inch of the section. A theoretical determination of the section required for these would be very difficult. If the simple case is taken of a uniformly loaded beam, supported at the ends with horizontal steel tension bars not bent up at the ends, the adhesion between concrete and steel which is required may be found thus: The difference of tension in 1-foot length of bars at the end of the span will be the tangential force between steel and concrete in that distance. The bending moment at the end is 0, and at 1 foot from the end $6w(l-12)$ inch pounds, where w is the load per inch run. Hence the increment of tension between the end and 1 foot from the end is

$$\frac{6w(l-12)}{d(1-\frac{1}{3}k)} \text{ lbs.}$$

If ψ is the total perimeter of the reinforcing bars, the adhesion stress is

$$\frac{w(l-12)}{2\psi d (1 - \frac{1}{3}k)} \text{ lbs. per sq. in.}$$

(b) Beams of T Section with Single Reinforcement.

In designing T beams where the upper flange forms a floor, the thickness d_1 of this will first be ascertained by considering the part between two ribs as a slab, having its own reinforcing bars transverse to the rib. The whole of this cannot in general be considered to form part of the upper flanges of the T beams. The width b_1 of the upper flange may be assumed to be not greater than one-third the span of the beams, or than three-fourths of the distance from centre to centre of the reinforced ribs.* The depth d should then be determined with reference to the stiffness required in the floor. In general d is from $\frac{1}{2}$ to $\frac{1}{8}$ of the span.

Two cases arise according as the thickness of flange is greater or less than kd , the distance from the neutral axis to the compressed edge. In the former case ($d_1 > kd$) the rules under (a) apply if b_1 is substituted for b , and $A = b_1 d_1 + b(d - d_1)$ for bd . The equations then become

$$\begin{aligned} \frac{mc}{t} &= \frac{k}{1-k} \\ k &= \sqrt{\left(\frac{2pAm}{b_1 d} + \frac{p^2 A^2 m^2}{b_1^2 d^2}\right)} - \frac{pAm}{b_1 d} \\ &= \sqrt{\left(\frac{2A_m}{b_1 d} + \frac{A_m^2 m^2}{b_1^2 d^2}\right)} - \frac{A_m}{b_1 d} \end{aligned}$$

* There is no satisfactory theoretical determination of the precise amount of the floor slab acting with the web.

$$z = \frac{1}{3}kd$$

$$t = \frac{M}{A_r d(1 - \frac{1}{3}k)} = \frac{M}{p A d(1 - \frac{1}{3}k)}$$

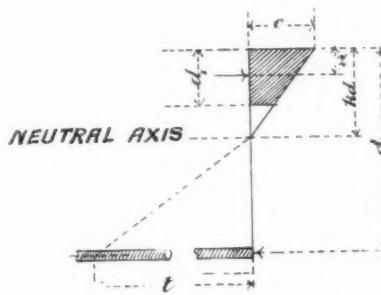
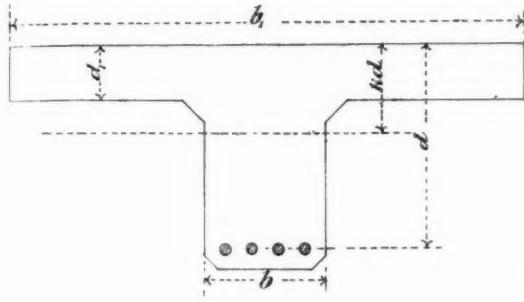
$$c = \frac{2M}{A_r d(1 - \frac{1}{3}k)} = \frac{2M}{k b_1 d (1 - \frac{1}{3}k)}$$

where $pA = A_r$ the section of reinforcement. The increment of tension in one foot length at the end of the beam and the adhesion stress is the same as in (a).

When d_1 is less than kd the small compression in the web between d_1 and kd may be neglected.

Let, as before, the whole area of section $= A = b_1 d_1 + b(d - d_1)$, and pA be the area of reinforcement.

$$\frac{mc}{t} = \frac{k}{1-k}$$



The mean compressive stress on the flange is

$$\frac{1}{2} \left(c + c \frac{kd - d_1}{kd} \right) = \frac{c}{2} \frac{2kd - d_1}{kd}$$

Equating the total tension and compression,

$$A_r t = p A t = \frac{1}{2} b_1 d_1 c \frac{2kd - d_1}{kd}$$

$$kd = \frac{b_1 d_1^2 + 2p A m d}{2b_1 d_1 + 2p A m} = \frac{b_1 d_1^2 + 2A_r m d}{2b_1 d_1 + 2A_r m}$$

$$\text{But } z = \frac{d_1}{3} \cdot \frac{3kd - 2d_1}{2kd - d_1}$$

Equating the moments

$$M = A_r t (d - z) = p A t (d - z) = \frac{1}{2} b_1 d_1 c \frac{2kd - d_1}{kd} (d - z)$$

$$t = \frac{M}{p A (d - z)}$$

$$c = \frac{2Mkd}{b_1 d_1 (2kd - d_1) (d - z)}$$

It may be useful also to point out that the area of reinforcement for a given value of c/t is

$$A = pA = \frac{c}{t} \cdot \frac{b_1 d_1 (2kd - d_1)}{2kd}$$

(c) *Slabs supported or fixed on more than two sides.*

It does not appear that there is either a satisfactory theory or trustworthy experiments from which the strength of rectangular slabs supported or fixed on all four edges can be determined. [See Appendices for a statement of some rules which have been used in determining the strength of slabs.]

COLUMNS OR PIECES SUBJECTED TO THRUST.

The reinforcement of columns should in general amount to at least 0·8 per cent. of the gross cross-section. The liability to bending of the longitudinal reinforcing bars greatly weakens the column, and should be prevented by steel binding bars. Some theoretical considerations would indicate that cross-binding is required at points not further apart than twenty-four times the least lateral dimension of the reinforcing rods. But experiment shows that still closer cross-binding, or, better, spiral binding,* greatly increases the strength of the column.

(a) *Short Columns axially loaded.*

If the load is strictly axial the stress is uniform on cross-sections. Let A_c be the cross-section of the column (including the reinforcement), and A the equivalent section as defined below, a the section of longitudinal reinforcing bars, P the load on the column in lbs. Let c be the stress on the concrete, and t that on the steel, the ratio of the coefficients of elasticity being m .

$$c = \frac{P}{A_c + (m-1)a} = \frac{P}{A}$$

$$t = \frac{mP}{A_c + (m-1)a} = \frac{mP}{A}$$

It appears that c may be taken = 500 lbs. per square inch, $t = 7,500$ lbs. per sq. in., and $E_s/E_c = m = 15$.

When the stress on the concrete is not greater than 500 lbs. per square inch, lateral bending of the column as a whole is not to be feared if the ratio of length to the least lateral dimension is not greater than 18.

(b) *Columns eccentrically loaded.*

If a column initially straight is loaded eccentrically, as when a beam rests on a bracket attached to the column, it may be regarded as fixed at the base and free at the loaded end. Then it must bend in the plane passing through the load, the deflection at the top being δ . Let x be the eccentricity of the load measured from the centre of the column when straight. Then the bending moment at the base of the column is $W(\delta + x)$. But it is known that δ will be small compared with x , provided that W is small compared with $2EI/l^2$, and this will be the case in such conditions as are likely to occur in designing concrete columns. Then the

* M. Considère recommends that the distance between the coils of the spiral should not exceed from $\frac{1}{10}$ to $\frac{1}{2}$ of the diameter of the spiral. In the case of piles subjected to longitudinal shock in driving there are special reasons for decreasing the distance between the cross-binding near the ends.

bending moment may be taken as Wx , and the stress at the base of the column, treating it as homogeneous, will be

$$f = W \left\{ \frac{1}{A} \pm \frac{x}{Z} \right\}$$

very nearly, where A is the whole section of the column and Z the modulus of the section relatively to an axis through the centre of gravity and at right angles to the plane of bending.

In dealing with reinforced columns which are not homogeneous, it is convenient to substitute for the actual section of the column what may be termed the equivalent section, or section of concrete equivalent in resistance to the actual column. If A_e is the area of section of the column (including the area of reinforcement), and a is the area of reinforcement, then the equivalent section is

$$A = A_e + (m - 1)a$$

If h is the depth of the section in the plane of bending, the moment of inertia relatively to the neutral axis can be expressed in the form $I = nAh^3$, and the section modulus in the form $Z = 2nAh$. (See Appendix III.)

It is desirable in columns that there should be no tension, and generally when the vertical load is considerable there is none. Cases in which the eccentricity is so great that there is tension must be treated by the methods applicable to beams if it is made a condition that the steel carries all the tension. In the following cases it is assumed that there is no tension.

Case I.—Column of Circular Section, Reinforcements Symmetrical and Equidistant from the Neutral Axis. Let m be the ratio E_s/E_c of the coefficients of elasticity of steel and concrete, A_e the cross-section of the column in square inches, a the area of reinforcement in square inches, h the diameter of the column, h_t the distance between the reinforcing bars perpendicular to the neutral axis. Then the equivalent section is

$$A = A_e + (m - 1)a$$

and the modulus of the section is (Appendix III.)

$$Z = \frac{1}{8}A_e h + \frac{1}{2}(m - 1)a \frac{h_t^2}{h}$$

The stress at the edges of the section can then be calculated by the general equation

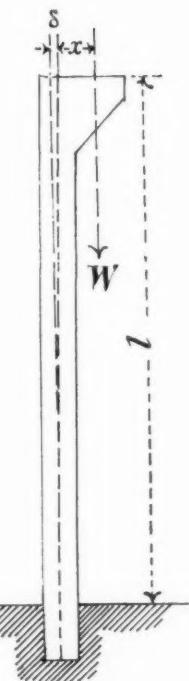
$$f = W \left\{ \frac{1}{A} \pm \frac{x}{Z} \right\}$$

where x is the eccentricity of the load in inches and W the load in pounds. The greater value of f must not exceed the safe stress stated above.

Case II.—Rectangular Section with Reinforcement Symmetrical and Equidistant from the Neutral Axis. Using the same notation as in the last case, h being now the depth of the section in the plane of bending, the section modulus is (Appendix III.)

$$Z = \frac{1}{6}A_e h + \frac{1}{2}(m - 1)a \frac{h_t^2}{h}$$

and the stresses are given by the same equation as in the previous case.



Case III.—Column of Circular Section with Reinforcing Bars arranged in a Circle.—Using the same notation as in Case I., h_i being the diameter of the circle of reinforcing bars, the section modulus is (*Appendix III.*)

$$Z = \frac{1}{8} A h + \frac{1}{4}(m-1)a \frac{h^2}{h},$$

and the stresses are given by the same equation as in Case I.

(c) *Long Columns axially loaded.*

For columns more than 18 diameters in length there is risk of lateral buckling of the column as a whole. The strength of such columns would be best calculated by Gordon's formula, but there are no experiments on long columns by which to test the values of the constants for a concrete or concrete and steel column. There does not seem, however, to be any probability of serious error if the total load is reduced in a proportion inferred from Gordon's formula to allow for the risk of buckling.

Let, as before, A_c = the section of the column in inches; a = the area of reinforcement. Then $A = A_c + (m-1)a$ is the equivalent section. Let n be the constant in the equation, $I = nAh^2$ (*Appendix III.*), and h the least transverse dimension of the column.

Then for a column fixed in direction at both ends, Gordon's formula is

$$\frac{W}{Af} = \frac{1}{1 + \frac{l^2}{cnh^2}} = \frac{1}{1+K}$$

so that the column will carry less than a short column of the same dimensions in the ratio of $1+K$ to 1, or, in other words, the column will be safe if calculated as a short column, not for the actual load W , but for a load $(1+K)W$.

The constant c has not been determined experimentally for reinforced long columns. But its probable value is

$$c = \frac{4\pi^2 E_c}{f}$$

where f is the ultimate crushing stress. Putting $E_c = 2,000,000$ and $f = 2,500$, then $c = 32,000$. Looking at the well-understood uncertainty of the rules for long columns, very exact calculation is useless. Some values of n for ordinary types of column are given in Appendix III. Taking these values, the following are the values of $1+K$:

VALUES OF $1+K$.

	Case I.	Case II.	Case III.
$\frac{l}{h}$	$n=0.098$	$n=0.075$	$n=0.0646$
20	1.13	1.17	1.19
25	1.20	1.26	1.30
30	1.29	1.38	1.44

The differences of $1+K$ for considerable differences of n are not very great. In any case n can be found by the method in the Appendix with little trouble.

In the case of columns fixed at one end and rounded or unfixed at the other, $2K$ must be substituted for K . If the column is rounded at both ends, $4K$ must be substituted for K .

APPENDIX I.—BACH'S THEORY OF THE RESISTANCE OF FLAT SLABS
SUPPORTED ON ALL EDGES AND UNIFORMLY LOADED.

By W. C. UNWIN.

The experiments of Professor Bach show that a flat square slab supported all round fractures along a diagonal, and the greatest stress is therefore on the diagonal section. It is the same apparently with rectangular slabs, though the evidence is not quite so clear. But if a diagonal fracture is assumed a very simple theory gives the stress.

Let the figure represent a rectangular slab with sides $2a$ and $2b$ in inches. Let the diagonal $BD = d$; the thickness of the slab = h ; the perpendicular on the diagonal $AE = c$; draw FG bisecting the sides and let p be the load per sq. inch. Consider the left-hand half of the rectangle. The total load on it is $2pab$ acting at the centre of gravity of ABD or at $c/3$ from the diagonal. Whatever the distribution of the reactions of the supports, from symmetry, the reaction on AB must act at the centre F of AB and the reaction on AD must act at the centre G of AD . Hence the resultant of the reactions on AB , $AD = 2pab$ must act at some point on the line FG or at a distance $c/2$ from the diagonal. Hence the bending moment on the diagonal section is

$$M = 2pab \left(\frac{c}{2} - \frac{e}{3} \right) = \frac{pabc}{3},$$

the stress at the diagonal section is

$$f = \frac{6M}{dh^2} = 2p \frac{abc}{dh^2}.$$

But $cd = 4ab$,

$$d^2 = 4a^2 + 4b^2,$$

$$f = 2p \frac{a^2}{a^2 + b^2} \frac{b^2}{h^2}.$$

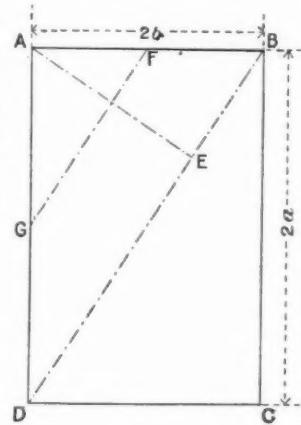
The following form of the equation is convenient :

$$f = \frac{\frac{1}{2} \left(\frac{a}{b} \right)^2}{\left(1 + \left(\frac{a}{b} \right)^2 \right)} \frac{W}{b h^2}.$$

Where W is the total load on the slab :

$\frac{a}{b} =$	$f =$
1	$0.25 \frac{W}{h^2}$
1.5	$0.23 \frac{W}{h^2}$
2	$0.20 \frac{W}{h^2}$

It would seem that if Bach's formula is to be used in calculating slabs, the reinforcing rods should be perpendicular to the diagonals of the rectangle.



APPENDIX II.—COMPARISON OF THE RESULTS GIVEN BY VARIOUS RULES FOR THE STRENGTH OF FLAT RECTANGULAR SLABS SUPPORTED ON ALL EDGES AND UNIFORMLY LOADED.

By WILLIAM DUNN.

The theories of Professor Grashof and of Professor Rankine assume that the maximum bending stress on the slab is at the centre, where there are two principal stresses on planes normal to each other, these planes coinciding with the major and minor axes of the slab.

The stress on the plane formed by the major axis of the slab (which is the greater of the two principal stresses) may be found in a simple manner as follows:

Let the length of the slab = a , and the breadth = b (where a is equal to or greater than b).

Calculate the bending moment on the slab (disregarding the end supports) as a beam supported or fixed at the sides only, of a span b under the total load on the slab. Multiply this bending moment by the factor s in the following table, to allow for the effect of the end supports. The result is the actual bending moment on the long axis of the slab.

When $\frac{a}{b} =$	Grashof's and Rankine's Rule		French Government Rule	
	$s = \frac{a^4}{a^4 + b^4}$	$r = \frac{b^4}{a^4 + b^4}$	$s = \frac{1}{1 + 2 \frac{b^4}{a^4}}$	$r = \frac{1}{1 + 2 \frac{a^4}{b^4}}$
1·0	0·50	0·50	0·33	0·33
1·5	0·83	0·16	0·71	0·09
2·0	0·94	0·05	0·89	0·03

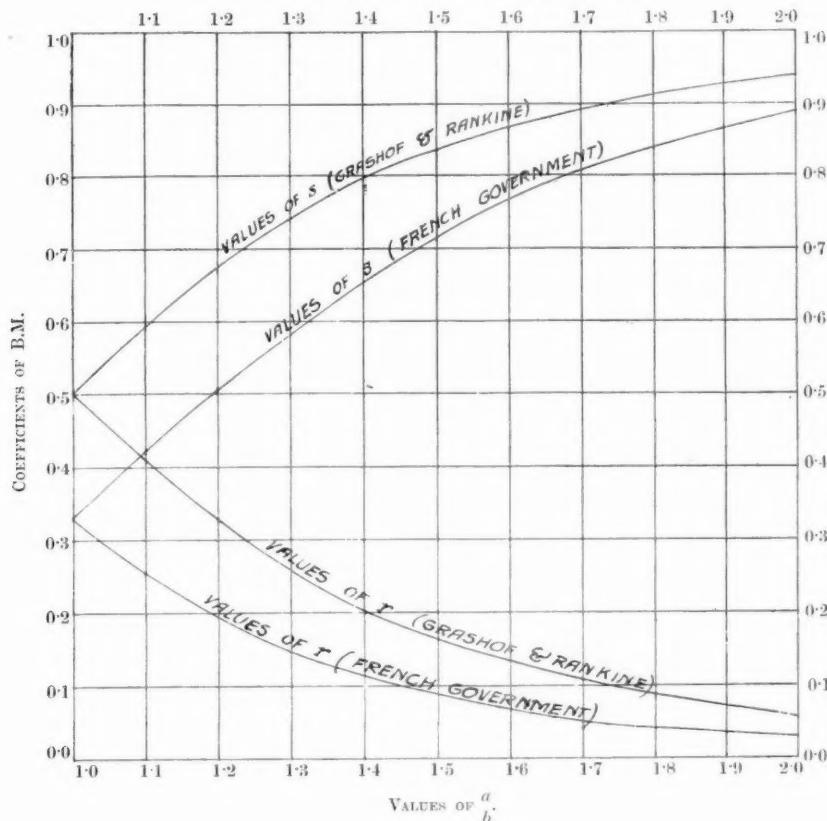
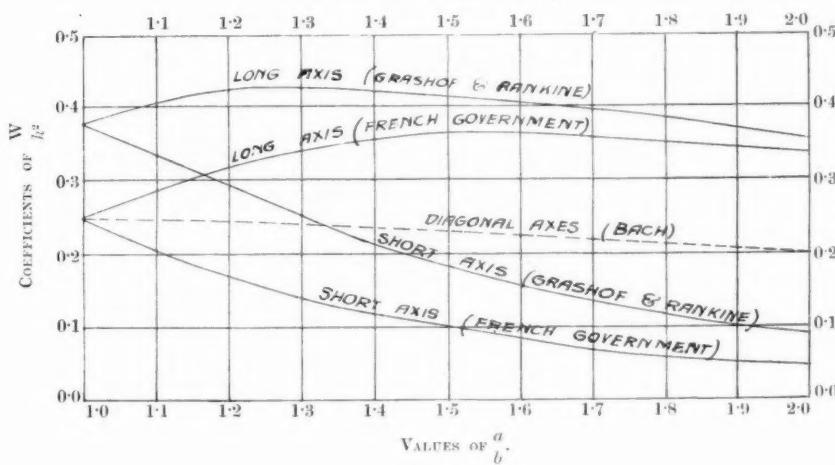
The stress on the section formed by the long axis of the slab is found in the usual way by equating this actual bending moment to the moment of resistance of that section.

Similarly the stress on the plane formed by the minor axis of the slab is found by assuming the slab supported or fixed at the ends (disregarding the effect of the side supports), calculating the bending moment as if the slab were a beam of span a under the total load on the slab. Reduce the bending moment so found by the factor r in the table above, and the result is the actual bending moment on the short axis of the slab.

The stress on the section formed by that axis is found as before by equating this moment to the moment of resistance of that section.

The reasoning by which we find the factors s and r is not entirely satisfactory, and other writers give other values. In the Instructions issued by the French Government to the Ingénieurs des Ponts et Chaussées with the Report of the Ministerial Commission du Ciment Armé the factors adopted give a greater importance to the effects of the third and fourth supports. The values of s and r , according to that report, are also given in the table above.

The maximum stresses on the sections as found by the foregoing rules when the slab is supported but not fixed all round are given in the table below, W being the total load uniformly distributed over the slab, h its thickness, and f the maximum stress due to bending.

BENDING MOMENTS (*Supported or Fixed*).STRESSES (*Supported only*).

When $\frac{a}{b} =$	Values of f according to Grashof and Rankine		Values of f according to French Government Rule	
	On Long Axis	On Short Axis	On Long Axis	On Short Axis
1·0	$0\cdot375 \frac{W}{h^2}$	$0\cdot375 \frac{W}{h^2}$	$0\cdot250 \frac{W}{h^2}$	$0\cdot250 \frac{W}{h^2}$
1·5	$0\cdot416 \frac{W}{h^2}$	$0\cdot183 \frac{W}{h^2}$	$0\cdot361 \frac{W}{h^2}$	$0\cdot101 \frac{W}{h^2}$
2·0	$0\cdot352 \frac{W}{h^2}$	$0\cdot088 \frac{W}{h^2}$	$0\cdot333 \frac{W}{h^2}$	$0\cdot045 \frac{W}{h^2}$

These results may be more readily compared by the diagram given above [p. 529].

It is implicitly assumed in the foregoing that the strength to resist bending is the same in both directions, so that the reinforcements longitudinal and transverse should be of equal area and at the same depth from the compressed face: they should be placed parallel to the ends and sides.

The stresses found by Bach's formula are also plotted on the diagram.

APPENDIX III.—THE MOMENT OF INERTIA OF SECTIONS OF REINFORCED CONCRETE.

By W. C. UNWIN.

If m is the ratio E_s/E_c of the coefficients of elasticity of steel and concrete, then an area A_s of steel is equivalent in resistance to mA_s of concrete. If A_e is the area of a section (including the area of reinforcing bars), and a the area of the reinforcing bars, then the section is equivalent to a section of area $A = A_e + (m - 1)a$ of concrete only. This will be called the equivalent section.

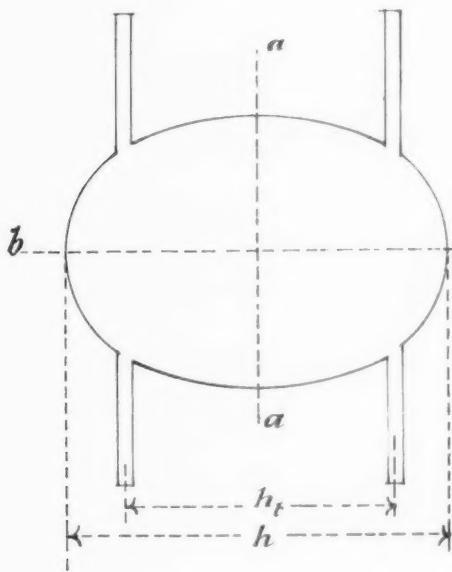
The moment of inertia of a section about its neutral axis can always be put in the form

$$I = nAh^2,$$

where h is the depth at right angles to the neutral axis and n is a constant depending on the form of the section. Thus for a rectangular section $I = \frac{1}{3}Ah^3$, and for a circular section $I = \frac{1}{6}Ah^2$.

In dealing with reinforced sections, it is convenient in many cases to express the moment of inertia in terms of the equivalent area. The equivalent area is found by adding to the actual area of the section portions of a total area $(m - 1)a$ at the same distance from the neutral axis as the reinforcing bars.

The figure shows a section for which b



is the plane of bending, and a the neutral axis passing through the centre of gravity of the section. The reinforcing bars are supposed symmetrical to the neutral axis. The projecting parts of total area $(m-1)a$ are the concrete areas equivalent to the steel. If I_c is the moment of inertia of the section without reinforcing bars, the moment of inertia with reinforcing bars is

$$I = I_c + \frac{1}{4}(m-1)ah_t^2.$$

Thus for a rectangular section

$$I = \frac{1}{12}A_e h^3 + \frac{1}{4}(m-1)ah_t^2,$$

and the modulus of the section is

$$Z = \frac{1}{6}A_e h + \frac{1}{2}(m-1)a \frac{h_t^2}{h}.$$

For a circular section

$$I = \frac{1}{16}A_e h^3 + \frac{1}{4}(m-1)ah_t^2,$$

and the section modulus is

$$Z = \frac{1}{8}A_e h + \frac{1}{2}(m-1)a \frac{h_t^2}{h}.$$

EXAMPLE 1.—RECTANGULAR SECTION.

Let $m=15$, $a=0.01A_e$, and $h_t=0.9h$. The equivalent area is $A=A_e+(m-1)a=A_e+14a=1.14A_e$.

$$\begin{aligned} I &= \frac{1}{12}A_e h^3 + \frac{14 \times 0.81}{4 \times 100}A_e h^3 \\ &= 0.1117A_e h^3. \end{aligned}$$

But $A_e=0.877A$

$$I = 0.098A_e h^3$$

$$Z = 0.196A_e h.$$

In this case in the general expression $I=nAh^3$, $n=0.098$ when A is the equivalent section.

EXAMPLE 2.—CIRCULAR SECTION.

Let $m=15$, $a=0.01A_e$, and $h_t=0.8h$. The area of the equivalent section is $1.14A_e$, as before.

$$\begin{aligned} I &= \frac{1}{16}A_e h^3 + \frac{1}{4} \times 14 \times 0.01A_e \times 0.64h^2 = 0.0849A_e h^3. \\ \text{But } A_e &= 0.877A. \end{aligned}$$

$$I = 0.0745A_e h^3.$$

$$Z = 0.149A_e h.$$

EXAMPLE 3.—CIRCULAR SECTION WITH REINFORCING BARS ARRANGED IN A CIRCLE.

The reinforcing bars are nearly equivalent to a ring of steel of the same total area. Let $m=15$, $a=0.01A_e$, and let the diameter of the circle of reinforcing bars be $h_t=0.8h$. The equivalent section is $A=1.14A_e$, as before.

$$\begin{aligned} I &= \frac{1}{16}A_e h^3 + \frac{m-1}{8}ah_t^2 \\ &= 0.0625A_e h^3 + 1.75 \times 0.01A_e \times 0.64h^2 \\ &= 0.0737A_e h^3 \\ &= 0.0646A_e h^3 \\ Z &= 0.1292A_e h. \end{aligned}$$

It will be seen that if the value of n in the equation $I = nAh^2$ for simple circular and rectangular sections, and the reinforced sections are compared, the results are as follows:—

	Simple Sections	Reinforced Sections
Case I.	$\frac{1}{2} = 0.0833$	0.098
Case II.	$\frac{1}{6} = 0.0625$	0.0745
Case III.	$\frac{1}{6} = 0.0625$	0.0646

The differences are not very great, so that while the value of n can always be found exactly when necessary for any proportion of reinforcement, there are cases such as that of columns where the value of n does not much affect the result, and where, from the nature of the calculation, great accuracy is impossible—for which a value of n can be assumed without any practically important error.

APPENDIX IV.—VALUE OF E_s/E_c .

By WILLIAM DUNN.

In the foregoing recommendations, as in the Prussian Government and various other foreign rules, the value of E_s/E_c for concrete of the kind usually employed, of hard stone or gravel mixed 1 : 2 : 4, is put at 15.

In reality, it varies with the age of the concrete, the proportions and nature of the materials, the stress at which it is taken, &c. As determined from tests of full-sized columns of concrete, with longitudinal reinforcement only and without transverse binding, it varied from a maximum of 10 at working loads to 15 to 21 at ultimate loads. For cinder concrete of 1 : 2 : 4 or 1 : 3 : 6 it varied from about 12 at working loads to 26 to 48 at ultimate loads.

This factor E_s/E_c is employed to determine the position of the neutral axis in beams, and it is found that while a variation between 10 and 15 makes no very great difference in the result, a value of 15 fixes the position of that axis nearest to the position found by experiment in singly reinforced beams. In fact, the formula given herein for the position of the neutral axis with $E_s/E_c = 15$ gives a result which agrees well with observed values in beam tests.

As mentioned above, it does not agree so well with the tests on columns: it gives too great an importance to the metal reinforcements, which becomes more noticeable when the percentage of reinforcement is considerable. But these tests were made on columns with longitudinal reinforcement only and without transverse binding, which latter adds greatly to the strength. This binding is explicitly required in the Prussian Government and other proposals where E_s/E_c is taken at 15; and that figure may be taken as making allowance in some degree for it.

We have no satisfactory determination of the increase in strength due to the transverse reinforcement, whether in single bindings or a continuous spiral.

In the Report of the French Commission du Ciment Armé, art. 5, it is stated that where the concrete has spiral binding or transverse or oblique reinforcements, so disposed as to resist swelling under thrust, the safe loads may be increased in some measure, but not in any case to more than $\frac{6}{5}$ of the crushing strength as determined from tests on cubes of 20 cm. sides at the age of 90 days.

In the explanatory circular accompanying that report (p. 6) the value to be given to E_s/E_c is discussed, and its theoretic value is put at about 10. It is stated, however, that it is preferable to regard that coefficient as the result of experiences on pieces with longitudinal and transverse reinforcements, and not as representing the ratios found from concrete and

metal separately. It is to be taken as varying from 8 when the longitudinal reinforcements have a diameter equal to $\frac{1}{10}$ of the least dimension of the piece and the bindings are spaced at a distance equal to that least dimension in the direction of the length; up to 15 when the longitudinal bars are $\frac{1}{20}$ of the least dimension and the bindings are spaced one-third of that distance apart. In both cases the bindings are to be near the outer face of the concrete.

Again, on p. 4 of the circular, it is stated that it is desirable to encourage the proper use of the metal in both longitudinal and transverse directions. While an exact determination of the increase of strength due to the transverse reinforcement would be difficult, the investigations of the Commission du Ciment Armé enable it to be admitted, *faute de mieux*, that it is found by multiplying the resistance to crushing of the concrete by a coefficient

$$1 + m' \frac{V'}{V}$$

V' being the volume of the transverse or oblique reinforcement, and V the volume of the concrete, m' being a variable coefficient depending on the efficiency of the union between the longitudinal bars. When the union is made by bindings in the usual way, m' varies from 8 when these bindings are spaced at a distance equal to the least transverse dimension of the piece to 15 when spaced at one-third that dimension.

When spiral binding is used m' varies from 15 to 32, the lower value being taken when the pitch of the spiral is $\frac{2}{3}$ of the least transverse dimension, and the higher when the spacing is $\frac{1}{5}$ of that dimension under a pressure of 50 kilos. per cm.², or $\frac{1}{3}$ under a pressure of 100 kilos. per cm.².

In no case should the working stress exceed $\frac{6}{10}$ of the resistance to crushing as determined on cubes, as before mentioned.

APPENDIX V.—EXAMPLES OF THE METHOD OF CALCULATION.

By WILLIAM DUNN.

RECTANGULAR BEAMS.

I. To determine the stresses on the steel and concrete of a floor slab 8 feet clear span, 6 inches thick, reinforced with bars $\frac{1}{2}$ -inch diameter ($= 0.1963$ square inch area each), spaced at 5-inch centres and 1 inch from the bottom, the load being 250 lbs. per square foot in addition to the weight of the slab. The slab is supported at the ends only.

Dead load: concrete $150 \times \frac{6}{12} = 75$ lbs. per square foot.

Wood floor, &c. = 5 " " "

Accidental load: as given above = 250 " " "

330

Take a 12-inch breadth of the slab: the span $l = (12 \times 8) + 6 = 102$ inches; and the bending moment = $M = \frac{wl^2}{8} = \frac{330}{12} \cdot \frac{102^2}{8} = 35,763$ in. lbs. on every foot in breadth.

The depth d is $6 - 1 = 5$ inches.

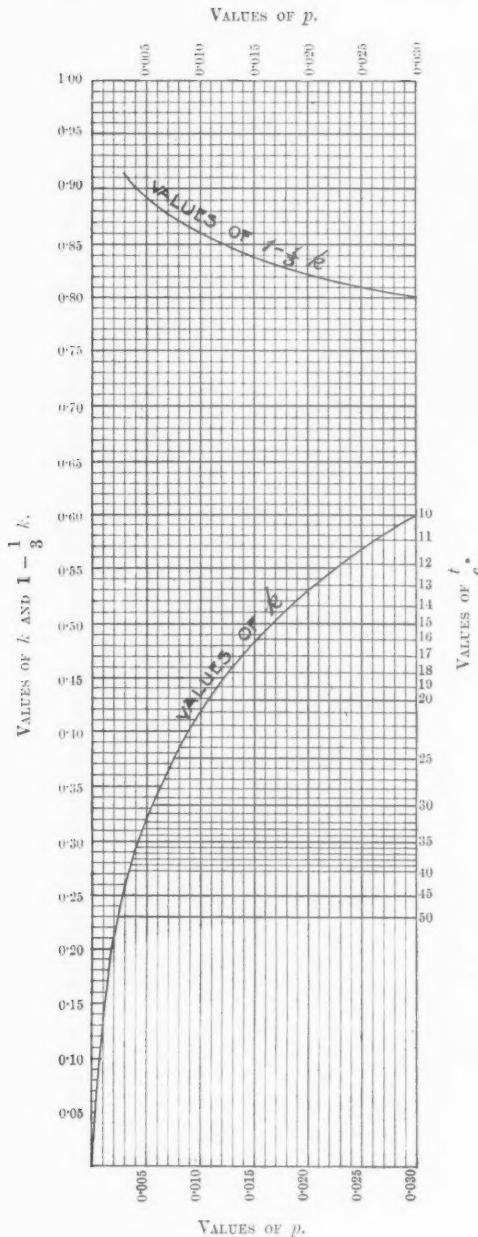
In every 12 inches in breadth there are $\frac{12}{5}$ bars, each 0.1963 square inch in section. Accordingly, from page 521, we have

$$p = A_r/bd = \frac{0.1963 \times \frac{12}{5}}{12 \times 5} = 0.0078$$

$$\begin{aligned}k &= \sqrt{(p^2 m^2 + 2pm) - pm} \\&= \sqrt{(0.0078^2 \times 15^2 + 2 \times 0.0078 \times 15) - 0.0078 \times 15} \\&= 0.381\end{aligned}$$

Also

$$1 - \frac{1}{3}k = 0.873.$$



NOTE.—When the proportion between the area of the steel and the area of the concrete is fixed, the proportion between the stresses in the two materials is also fixed. It is convenient to have the values of p , k , $(1 - \frac{1}{3}k)$, and $\frac{t}{c}$ in the form of a diagram showing the relations of each with the others, and such a diagram is given herewith. Thus, given the value of $p = 0.0078$, trace the vertical corresponding to that from the scale at foot to intersection with the first curve. From this intersection trace the horizontal to the scale at right and read the corresponding value of $\frac{t}{c} = 24.2$; trace the horizontal to the left and read the corresponding value of $k = 0.381$. Similarly trace the same vertical to intersection with upper curve and the horizontal through that intersection, read on the scale at the left, gives the corresponding value of $1 - \frac{1}{3}k = 0.873$.

The stress in the steel is (page 522)

$$\begin{aligned}t &= \frac{M}{pbd^2(1 - \frac{1}{3}k)} \\&= \frac{35,763}{0.0078 \times 12 \times 25 \times 0.873} \\&= 17,505 \text{ lbs. per square inch.}\end{aligned}$$

The stress on the concrete is

$$\begin{aligned}c &= \frac{2M}{kb d^2(1 - \frac{1}{3}k)} \\&= \frac{71,526}{0.381 \times 12 \times 25 \times 0.873} \\&= 717 \text{ lbs. per square inch.}\end{aligned}$$

If the floor slab were fixed at the supports by reason of the slab being continuous over beams, or properly fixed in the walls, the bending moment at the centre may be taken at $\frac{w l^2}{12}$ and that at the ends as $\frac{w l^2}{24}$. The bending moment at centre being $\frac{w l^2}{12} = \frac{330}{12} \times \frac{102^2}{12} = 23,842$ inch lbs., the stress in the steel would be

$$\begin{aligned}t &= \frac{M}{pbd^2(1 - \frac{1}{3}k)} \\&= \frac{23,842}{0.0078 \times 12 \times 25 \times 0.873} \\&= 11,670 \text{ lbs. per square inch.}\end{aligned}$$

The stress in the concrete would be

$$c = \frac{2M}{k b d^2 (1 - \frac{1}{3}k)} = \frac{47,684}{0.381 \times 12 \times 25 \times 0.873} = 477 \text{ lbs. per square inch.}$$

The stresses at the supports will be half these amounts, and accordingly the concrete must be reinforced over the supports with bars half the area of those at the centre and 1 inch below the top surface, as well as with the bars in the lower part; i.e., $0.1963 \times \frac{12}{5} \times \frac{1}{2} = 0.235$ square inch per foot in width, or, say, $\frac{3}{8}$ inch rods 5 inch centres.

The maximum shear occurs at the supports, and is $S = \frac{330 \times 8}{2} = 1,320 \text{ lbs.}$

The maximum shearing stress is $\frac{S}{bd(1 - \frac{1}{3}k)} = \frac{1,320}{12 \times 4.365} = 25 \text{ lbs. per square inch.}$

The maximum adhesive stress is (page 494)

$$\frac{w(l - 12)}{2\psi d(1 - \frac{1}{3}k)} = \frac{33.0(102 - 12)}{2 \times 1.57 \times \frac{12}{5} \times 4.365} = 75 \text{ lbs. square inch.}$$

II. A beam of 15 feet 4 inches span from centre to centre of bearings is required to carry an uniformly distributed load of 10 tons. The stress on the steel is to be 17,000 lbs. per square inch, and on the concrete 600 lbs.; the breadth of the beam is to be 14 inches. To find the sectional area of the metal and the depth required.

The bending moment is

$$\frac{Wl}{8} = \frac{10 \times 2,240 \times 184}{8} = 515,200 \text{ in. lbs.}$$

From page 521 :—

$$\frac{mc}{t} = \frac{k}{1-k} \quad \therefore \frac{15 \times 600}{17,000} = \frac{k}{1-k} \quad \therefore k = \frac{9}{26}$$

$$k = 0.346 \text{ and } 1 - \frac{1}{3}k = 0.8847$$

Also from page 521 :—

$$ck = 2pt, \text{ that is, } 600 \times 0.346 = 2p 17,000. \\ \therefore p = 0.0061.$$

From page 522 :—

$$t = \frac{M}{pb d^2 (1 - \frac{1}{3}k)} = \frac{515,200}{17,000} = \frac{515,200}{0.0061 \times 14 \times d^2 \times 0.8847}$$

$$d = \sqrt{\frac{515,200}{0.0061 \times 14 \times 0.8847 \times 17,000}} = \sqrt{401} = 20 \text{ in.}$$

Sectional area of metal = $pbd = 0.0061 \times 14 \times 20 = 1.708 \text{ square inches.}$

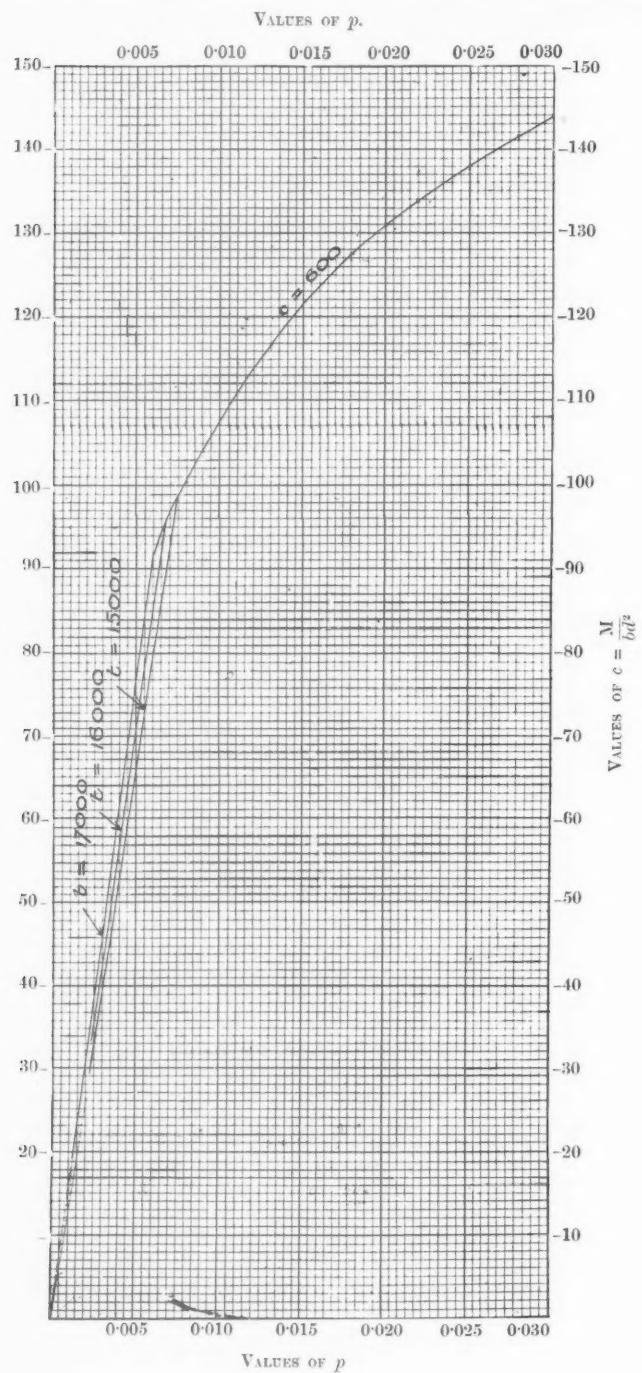
Four rods each $\frac{3}{4}$ in. diam. = 0.44 square inch would give this area.

NOTE.—The equation for the strength of rectangular beams of reinforced concrete is frequently put in the form $M = Cbd^2$, where C has a value varying with the proportion of the reinforcement and the maximum stresses allowed in the concrete and metal. Thus, when the maximum stress in the steel is not to exceed 17,000 lbs. per square inch and in the concrete 600 lbs., the values of C for $p = 0.005$ is 76.0; for $p = 0.01$ it is 107.7; for $p = 0.015$ it is 121.69, &c. The diagram on p. 536 gives the range of values for ordinary proportions of reinforcement.

As an example of the use of this diagram, let it be required to find the proportion of reinforcement which must be used in the example first given in order that the stresses in the steel and concrete may not exceed 17,000 and 600 lbs. per square inch respectively.

From the equation $Cbd^2 = M$ we have by inserting the values formerly given

$$C \times 12 \times 25 = 35,763 \\ \therefore C = 119.2.$$



Tracing the horizontal through this value in the scale at the right or left hand sides of the diagram to intersection with the curve, and the vertical through the intersection to the scale at foot, we find that p must equal 0·014, and as $pld = A_r$, we have $0\cdot014 \times 12 \times 5 = 0\cdot84$ square inch in a breadth of 12 inches. A $\frac{3}{4}$ -inch rod is 0·44 square inch area, so that $\frac{2}{3}$ rods at $6\frac{1}{4}$ -inch centres would give this proportion; or $\frac{2}{3}$ rods at $4\frac{1}{2}$ -inch centres.

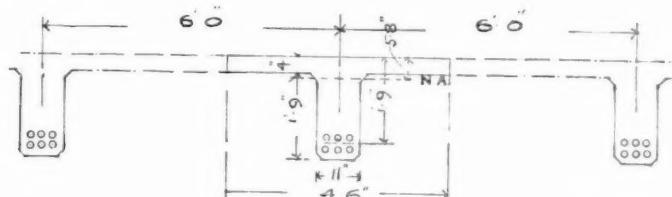
As another example, a beam is required to carry a distributed load of 20 tons (including its own weight) at 12 feet span. It is to be reinforced with 1 per cent. of metal, and the stresses must not exceed 17,000 lbs. in the steel or 600 in the concrete. The breadth is to be 18 inches; what is the necessary depth?

The value of c corresponding to $p = 0\cdot01$ is found from the diagram to be 107·7. We have therefore

$$\begin{aligned} Cbd^2 &= M \\ 107\cdot7 \times 18 \times d^2 &= 20 \times 2,240 \times 141 \\ d^2 &= \frac{8}{\sqrt{415}} \\ d &= 20\cdot37 \text{ inches} \end{aligned}$$

T BEAMS.

III. A floor, 24 feet span, constructed as in the figure annexed, with 4-inch floor slab and main beams spaced at 6-foot centres, carries a load of 130 lbs. per square foot, uniformly distributed. There are six rods $\frac{3}{8}$ inch diam. in the lower part of the beams, having a total sectional area of $0\cdot6 \times 6 = 3\cdot6$ square inches. It is required to find the maximum stress on the steel and the concrete.



Weight of floor :—

	lbs. per foot run
Slab $6' \times 4'' \times 150$ lbs.	= 300
Beam $1' 9'' \times 11'' \times 150$ lbs.	= 200
Asphalte flooring $6' \times 1' \times 12\cdot6$ lbs.	= 76
Dead load	636
Accidental or imposed load $6' \times 1' \times 130$	780
Total load	1,416

The bending moment, the ends being simply supported, is

$$\frac{wl^2}{8} = \frac{\frac{1+1.6}{1.2} \times 288^2}{8} = 1,223,424 \text{ inch lbs.}$$

The width of the slab to be reckoned as acting with the beam is $6 \text{ feet} \times \frac{3}{4} = 4 \text{ feet}$
6 inches = 54 inches.

Position of the neutral axis :—

$$kd = \frac{b_1 d_1^2 + 2A_r m d}{2b_1 d_1 + 2A_r m} = \frac{54 \times 16 + 2 \times 3\cdot6 \times 15 \times 21}{2 \times 54 \times 4 + 2 \times 3\cdot6 \times 15} = 5\cdot8 \text{ in.}$$

Distance from top surface to centre of pressure in concrete :—

$$z = \frac{d_1}{3} \cdot \frac{3kd - 2d_1}{2kd - d_1} = \frac{4}{3} \cdot \frac{17\cdot4 - 8}{11\cdot6 - 4} = 1\cdot65 \text{ inch.}$$

Stress on the steel :—

$$t = \frac{M}{pA(d-z)} = \frac{1,123,424}{3.6(21 - 1.65)} = 17,563 \text{ lbs. per square in.}$$

Stress on the concrete :—

$$c = \frac{2Mkd}{b_1d_1(2kd-d_1)(d-z)} = \frac{2 \times 1,123,424 \times 5.8}{54 \times 4(2 \times 5.8 - 4)(21 - 1.65)} = 447 \text{ lbs. per sq. in.}$$

Max. shearing force at ends :—

$$S = \frac{1,416 \times 24}{2} = 16,992 \text{ lbs.}$$

and the shearing stress is

$$\frac{S}{b(d-z)} = \frac{16,992}{11 \times 19.35} = 79 \text{ lbs. per sq. in.}$$

As this is a greater shearing stress than is permissible on the concrete, it would be necessary to bend upwards the three upper rods in the usual manner, near the ends. The permissible shearing stress on the concrete being 60 lbs., the amount which the concrete could take is $\frac{16,992 \times 60}{79} = 12,905$ lbs., and the points at which this occurs, and at which the rods should

bend up, is $\frac{16,992 - 12,905}{1,416} = 2.8$ feet from the ends. The adhesion stress on the lower rods near the ends is

$$\frac{w(288 - 12)}{2\psi(d-z)} = \frac{\frac{1}{12} \times 276}{2 \times 3 \times 2.748 \times 19.35} = 102 \text{ lbs. per. sq. in.}$$

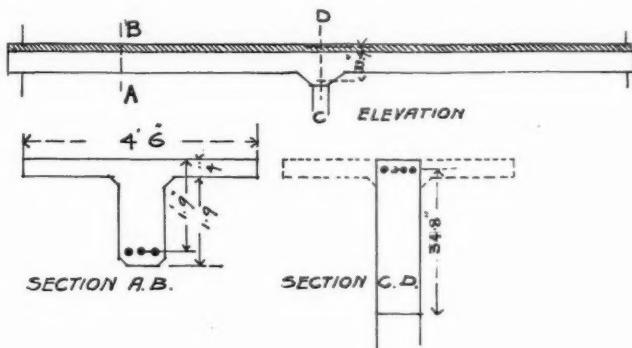
NOTE.—Diagrams similar to that on page 536 may be prepared which very much lessen the labour of calculations for T beams. There is usually little error in reckoning T beams as rectangular beams of breadth b , and depth d , the percentage of metal being taken in relation to the rectangle b, d .

CONTINUOUS BEAMS.

IV. The exact determination of the stresses in a beam on three or more supports—tedious enough in the case of steel beams of which the moment of inertia at any section can be exactly determined—is rarely attempted with reinforced concrete beams. When a case is sufficiently important to justify the labour, the investigation is usually made on the assumption of a constant moment of inertia (uniform section)—a condition seldom realised. In the case of T beams, the section is T form near the centre of the span, where there is a positive moment; but over the supports the moment is negative, and the tension is in the upper part. As the concrete is not reckoned as taking any tension, the flange or horizontal (side) parts of the T are not reckoned in the calculation, and the beam is taken as a rectangular beam. The assumption of constant cross-section is thus not accurate. Building in the ends of beams into walls rarely fixes the ends in a perfect way, and there is always the risk of unequal settlement of the supports altering the whole conditions and stresses.

How much allowance to make for the end moments over the supports is largely a matter for the judgment and experience of the designer. When end moments are, however, allowed for, and the central moments correspondingly reduced, calculations should always be made to ascertain that the sections and reinforcements at the ends are sufficient to resist the moments allowed for.

Suppose the floor in the last example, but reinforced with three $\frac{3}{8}$ -inch diameter rods only, is continuous over two equal spans. The negative bending moment over the centre support on the assumption of a constant cross-section would be $-\frac{wl^2}{8} = 1,223,424$ in. lbs. The floor slab being at this point in tension is not reckoned; so we take the section as a rectangle, and it is generally necessary to increase the depth at the supports in the manner shown in



section C D above. Let the stresses for steel and concrete be respectively 17,000 and 600 lbs. per square inch. For $\frac{t}{c} = \frac{17,000}{600}$, the corresponding value of p is 0.0061. We find from the diagram (page 536) that with this value of p the value of C is 91.8, and from the formula $Cbd^3 = M$ we find

$$d = \sqrt{\frac{M}{Cb}} = \sqrt{\frac{1,123,424}{91.8 \times 11}} = 34.8 \text{ inches.}$$

The sectional area of metal required is $34.8 \times 11 \times 0.0061 = 2.33$ square inches, and four rods $\frac{3}{8}$ -inch diameter give this.

The maximum positive bending moment in the spans is found at $\frac{3}{8}l$ from each end. It is equal to $\frac{9wbl^3}{128} = \frac{9 \times \frac{1416}{12} \times 288^2}{128} = 688,176$ in. lbs. Here we have the T section and use the formula (page 523) to find the position of the neutral axis :

$$kd = \frac{b_1 d_1^2 + 2A_1 m d}{2b_1 d_1 + 2A_1 m} = \frac{54 \times 16 + 2 \times 2.4 \times 15 \times 21}{2 \times 54 \times 4 + 2 \times 2.4 \times 15} = 4.71 \text{ inches.}$$

Distance from top surface to centre of pressure in concrete :—

$$z = \frac{d_1 \cdot 3kd - 2d_1}{3 \cdot 2kd - d_1} = \frac{4}{3} \cdot \frac{3 \times 4.71 - 2 \times 4}{2 \times 4.71 - 4} = 1.507 \text{ inch.}$$

Stress in steel :—

$$t = \frac{M}{pA(d-z)} = \frac{688,176}{2.4(21 - 1.507)} = 14,711 \text{ lbs. per square inch.}$$

Stress in concrete :—

$$c = \frac{2Mkd}{b_1 d_1 (2kd - d_1)(d-z)} = \frac{2 \times 688,176 \times 4.71}{54 \times 4 (2 \times 4.71 - 4) (21 - 1.507)} = 284 \text{ lbs. per square inch.}$$

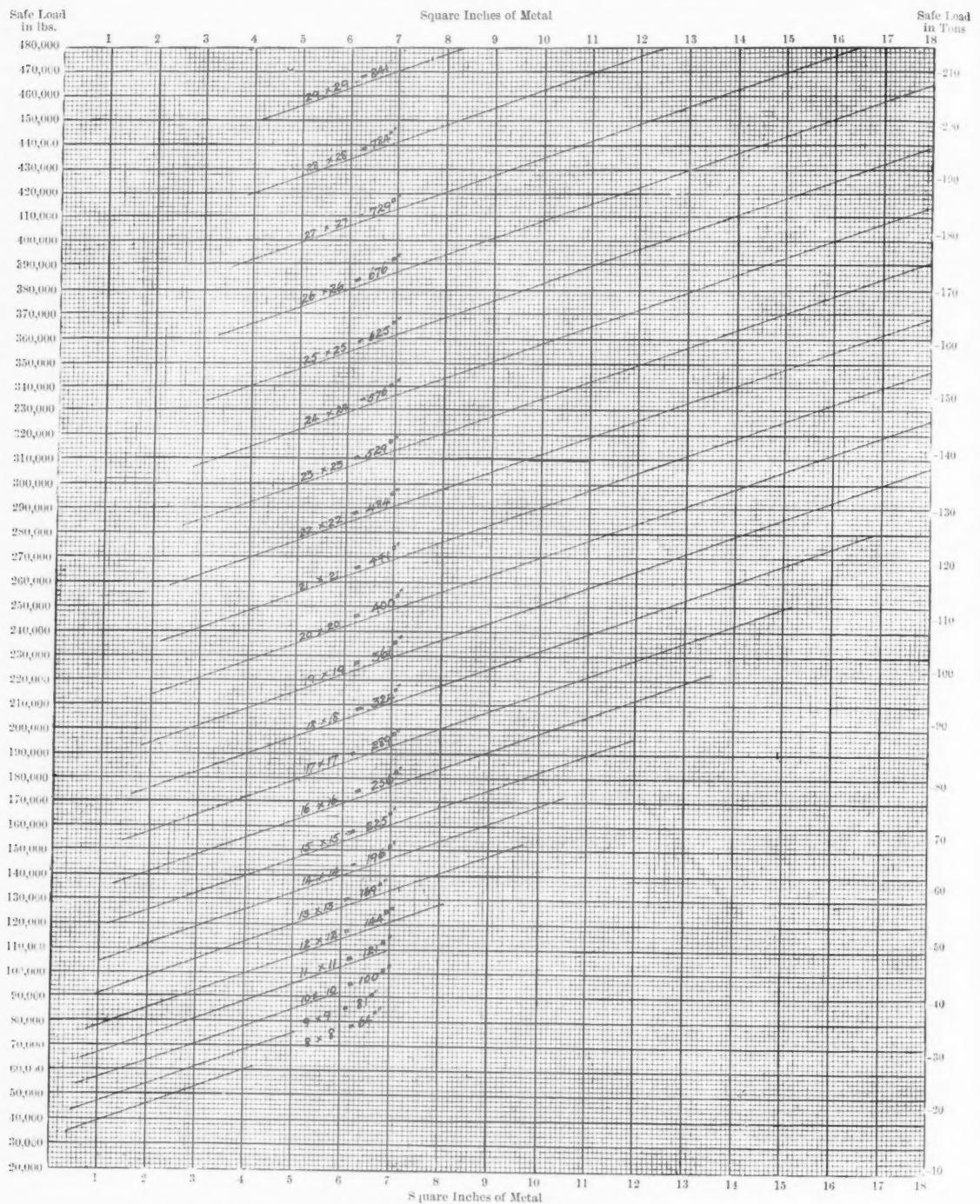


DIAGRAM SHOWING SAP LOAD ON CONCRETE COLUMNS REINFORCED WITH LONGITUDINAL RODS, WITH CROSS BINDINGS.

COLUMNS.

Axial Loading.

V. A column of reinforced concrete 12 inches square, reinforced with four rods each $\frac{3}{8}$ -inch diameter (total area of steel rods $0.6 \times 4 = 2.4$ square inches), which rods are bound together at intervals of a foot with $\frac{3}{16}$ -inch diameter wires, supports a load of 80,000 lbs., applied axially. To find the stresses on the steel and the concrete :—

Stress in concrete :—

$$c = \frac{P}{A_c + (m-1)a} = \frac{80,000}{144 + 14 \times 2.4} = 450 \text{ lbs. per square inch.}$$

Stress in steel :—

$$t = \frac{mP}{A_s + (m-1)a} = \frac{15 \times 80,000}{144 + 14 \times 2.4} = 6,757 \text{ lbs. per square inch.}$$

NOTE.—The strength of concrete columns reinforced with vertical rods may readily be obtained from a diagram such as that given on page 540, which has been calculated for a maximum stress of 500 lbs. per square inch in the concrete, with $m = 15$.

Eccentric Loading.

A column of the section shown in the margin has to support a load applied at O, 2 inches from the centre. What is the maximum load to be applied if the maximum stress on the concrete is limited to 500 lbs. per square inch ?

From the figure we have $A_c = 16 \times 16 = 256$ square inches ; $h = 16$; $h_i = 13$; $x = 2$.

Then from page 525 :—

$$A = A_c + (m-1)a = 16 \times 16 + (14 \times 0.6 \times 4) = 290$$

$$\begin{aligned} Z &= \frac{1}{6} A h + \frac{1}{2} (m-1)a \frac{h_i^2}{h} \\ &= \frac{1}{6} \times 256 \times 15 + \frac{1}{2} (14 \times 2.4) \frac{169}{16} = 817.45 \end{aligned}$$

The stresses at the edges of the section are :—

$$f = W \left\{ \frac{1}{A} \pm \frac{x}{Z} \right\} = W \left(\frac{1}{290} \pm \frac{2}{817.5} \right)$$

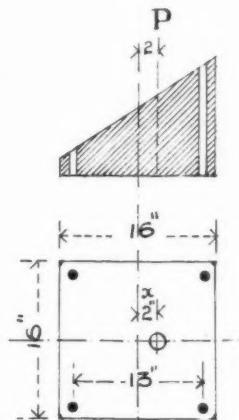
Taking the maximum stress at 500 lbs. :—

$$500 = W \times \frac{817.5 + 580}{237,075},$$

$$\text{or } W = \frac{500 \times 237,075}{1397.5} = 84,821 \text{ lbs.}$$

The stress at the side farthest from the load is :—

$$f = W \left\{ \frac{1}{A} - \frac{x}{Z} \right\} = 84,821 \left\{ \frac{1}{290} - \frac{2}{817.5} \right\} = 85 \text{ lbs. per square inch.}$$





9, CONDUIT STREET, LONDON, W., 15th June 1907.

CHRONICLE.

The County Hall Competition.

The proceedings at the Special General Meeting of the 28th ult. were briefly indicated in the Minutes printed in the last number of the JOURNAL, and it now remains to report the discussion. The Meeting had been summoned by the Council, in compliance with the requisition of Messrs. James S. Gibson [F.], H. V. Lanchester [F.], E. A. Rickards [F.], W. G. Wilson [F.], Alfred W. S. Cross [F.], C. E. Mallows [F.], Herbert Read [F.], R. Falconer MacDonald [F.], Herbert W. Wills [A.], C. E. Hutchinson [A.], John Anderson [A.], and J. R. Best [A.], for the following purposes, viz.: (a) To consider the conditions and instructions issued by the London County Council governing the competition for a new County Hall (and any replies to competitors forming part of such conditions). (b) To consider any action taken by the Institute Council with reference to the initiation, conduct, conditions, and instructions of the competition. (c) To propose any resolutions which may arise out of the subjects or matters dealt with under Clauses (a) and (b).

THE PRESIDENT (Mr. Thos. E. Collett) having stated the business of the Meeting,

Mr. JAMES S. GRISWOLD [F.] addressed the Meeting, reading his remarks, as follows:—

Mr. President and Gentlemen,—I have felt that this matter of the new County Hall Competition has arrived at a stage when it is necessary that the whole body of the Institute should have the facts, as far as they are known to me at any rate, laid before them, and I hope, with your indulgence, as briefly as possible to place before you a statement of the conditions and instructions governing the competition, and, as far as I also know them, the efforts made by the Council to deal with the matter.

In dealing with this matter it shall be my endeavour to treat it from the impersonal standpoint, and I think we should all look at it from the point of view of public policy, and leave as much as we can of personal feelings, likes and dislikes, out of the question. In this way we shall arrive at sounder conclusions, and shall not be saying in haste what we might repent at leisure. As far as it is necessary to say anything personal about the Assessors and the seven members of the Institute who have accepted the invitation to submit designs, I shall be as careful as I can in my language, and can assure them that I have no personal

bias or feeling regarding them. I hope they will agree with me that a matter which so closely affects the well-being of the profession should be discussed, and some conclusion arrived at, by the members of the Institute.

The project of building a new County Hall is one which has been familiar to us all for some years, and I believe that the great majority of architects, and certainly the best architects, of the Institute would have been delighted to submit designs, sparing neither brains, time, nor money to produce the finest schemes of which they are capable, if the conditions governing this competition were fair and honourable. I am certain that an appeal to the architects of this country on broad, public-spirited lines would have met with a most generous response, for I know of no profession which is so ready to give of its best, almost without thought of recompense and reward, as our own profession. Unfortunately that public-spirited and generous appeal has not been made, and the Instructions as issued are not fair and honourable, and so we have met to-night to see what is best to be done.

First, let me say that we are not here either individually or collectively as architects fighting for our own hand; we are here as members of an Institute of long standing and honourable name, whose constitution, laws, and regulations we must uphold and transmit untautened to our successors. These regulations and laws have been made in the interest of the public and of the whole profession, not of any section or party, and any attempt to set these regulations aside on any pretext whatever should be closely scrutinised, and if found unworthy should be resisted by us all.

I would now direct your attention to the scheme of the Competition as set out in the Instructions issued by the London County Council, and point out in detail where these contravene our Regulations, and where I consider they are unjust and dishonourable and contrary to the public interest.

In the early days of 1906 the Institute approached the County Council with the object of offering advice or assistance in the matter of obtaining designs for a new County Hall which would be worthy of its important purpose and would take its place among the other great buildings of London, and the Council of the Institute immediately appointed a committee to deal with the matter and report. The result was a series of suggestions on certain definite lines which were laid before the County Council for its consideration and adoption if possible. These suggestions were broadly as follows:—

1. A competition was advocated, this competition to be in two stages: the preliminary, open to all architects, and the final, open to those selected.

2. A limited number of architects should be invited to take part in the final stage, without having to pass through the preliminary.

3. The drawings to be submitted in the preliminary competition to be as few in number and small in scale as possible, so as to secure the personal labour of the architect, not the services of the mechanical draughtsman.

4. A jury of three Assessors, appointed as follows:—One by the competitors in the preliminary competition, one by the President of the R.I.B.A., and the third to be the Superintending Architect of the London County Council.

5. The architect whose design is selected as best by the Assessors in the final stage to be appointed as Architect for the buildings, unless in the opinion of the Assessors there is any grave reason to the contrary.

The Conditions of this Competition were never laid before the Institute Council, and we have never had any opportunity to express an opinion on them. It has been stated at a meeting of the London County Council and in the public Press that these Conditions had been approved by the Royal Institute of British Architects. I should be sorry to think that the Institute should at any time endorse conditions which are subversive of good architecture. The Council of the Institute have protested against these very

conditions, and we are backing the Council up by this endeavour to get them amended. The germ idea of the Institute Council was to provide the means of finding, if possible, a great architect and this was outlined in the suggestion for only small-scale drawings, which would allow him to express his own ideas in his own way. This has been changed in the issued Instructions to the usual $\frac{1}{4}$ -inch-scale drawings, which will probably be painfully elaborated in the strictly mechanical and useless sense. Many precious weeks of time will probably be spent in absurd detailing of trifles, and great architectural ideas will be subservient to mechanical labour. A jury of three Assessors was suggested to select the designs in both stages. This idea has been rejected in favour of a jury of two in the preliminary competition and a jury of three in the final stage. This is a matter of vital importance: the jury of three ought to be appointed at the outset, and all designs ought to be submitted to them. If the services of three Assessors are necessary in order to make a wise final choice from a limited number of designs, the need for their combined judgment is more imperative in the preliminary competition. The success of the competition largely depends on the choice made in the preliminary stage, and it is in this stage that the jury of three Assessors would command the confidence of all architects. In the Institute Regulations for the Conduct of Architectural Competitions clause 1 says: "All the designs sent in should be submitted to the Assessors," and this is clearly a case where all the designs are not to be submitted to the whole of the Assessors, but only a very small portion of them.

The Institute Council also advised that the architect whose design was finally selected should be appointed architect for the buildings, provided no grave reason to the contrary could be found. The County Council, however, make it a condition that the Superintending Architect shall be practically joint architect with the selected competitor for the buildings. They stipulate that Mr. W. E. Riley, the Official Architect, shall have discretionary power in all matters relating to internal economy, building construction, and stability. "The successful architect shall obtain all the information he requires upon the site, making the necessary estimates, preparing all the necessary sketches, working drawings, detail drawings, and specifications, subject to the Council's approval in all matters which in the opinion of the Official Architect should be brought to it for decision. The successful architect shall prepare all the necessary copies of the drawings and documents for the proper execution of and use on the works, and also the drawings, &c., for the records of the Council, and exercise"—(this is important)—"in conjunction with the Official Architect, general and usual superintendence of works during progress, examine and certify the accounts for the works and payments under the contract. For these services the successful architect and the Council's Official Architect will be remunerated on the basis of the usual five per cent. on the total cost of the completed building, other than the work connected therewith which will not devolve upon the successful architect, and this commission will be paid in the usual manner and will be divisible between the two architects in the proportion of nine-tenths to the successful architect and one-tenth to the Council's Official Architect."

I wish to point out that Mr. Riley is not only made joint architect, and his duties and emoluments defined in the Instructions, but he is also at the same time one of the two Assessors who have drawn up the Conditions, and who will be the sole judges in the preliminary stage of the competition. This dual appointment as Assessor and joint architect strikes at the root of the proper conduct of public competitions, and must be felt by all right-thinking men to be against the public interest. I would also draw your attention to clause 3 of our Regulations for the Conduct of Competitions, which is as follows:—"No pro-

moter of a competition, and no Assessor engaged upon it, nor any employé of either, should compete, or act as architect, for the proposed work." You can see how flagrantly this regulation has been violated. I am not proposing to hazard any guess at the reason for this dual appointment of Mr. Riley as Assessor and joint architect. Various explanations have been offered to me by others, such as the special knowledge which Mr. Riley has of the requirements of this building, or the expediency of having the Official Architect to look after the interests of the L.C.C. in so large a matter, or the possibility of a design being selected which is the work of a Frenchman, or an American, or other international architect; but I do not think it necessary to insult your intelligence or waste your time by seriously considering these explanations, which explain nothing except their own fatuousness.

I want to put this matter very shortly and clearly to you. Here is a regulation framed in the interests of the whole architectural profession, a regulation which is necessary to preserve and ensure the proper conduct of competitions as far as Assessors and employés of the promoters are concerned. Its language is clear and simple: "No Assessor engaged upon a competition should compete or act as architect for the proposed work," and yet we find the appointment of Mr. Riley (an Assessor) as joint architect one of the essential conditions of the competition. The Regulation says no employé of the promoters of a competition should compete or act as architect for the proposed work, and yet we find the appointment of Mr. Riley (an employé of the L.C.C.) as joint architect one of the essential conditions of the competition. Even did we admit that the Regulations of the Institute might be regarded with a certain latitude in cases where a definite gain to the public would thereby be ensured, one fails to see the slightest justification in this case, as the public interests can be equally well safeguarded without inflicting any indignity on the architectural profession.

We are also face to face with this curious state of things: out of the seven invited architects who have accepted the invitation to compete, five are now members of the Council of the Institute, and one was a member when this matter was being considered, making a total of six out of seven.

These gentlemen have evidently accepted, perhaps inadvertently, the present conditions of this competition, and have thereby transgressed the Regulations of the Institute, and, as far as I know, have given no explanation of their conduct either to the Council of the Institute or to the members. But perhaps we shall have from them some such explanation to-night.

The Council also, as far as I know, have not called upon these gentlemen to explain or justify their action; and so serious has this scandal been considered by some members of the Council that it was felt we could only show our disapproval of such conduct by resigning from the Council of the Institute, and Messrs. Cross, Mallows, Lanchester, and myself have accordingly resigned so that we may be independent of the Council at this meeting.

[An objection at this point by Mr. R. F. Chisholm [F.] and another member against the use of such terms as "scandal" and "dishonourable" was upheld by the President.

Mr. GIBSON intimated his acceptance of the President's ruling, and continued: I have stated to you that, so far as I know, the members of the Council of the Institute who have been invited to take part in this competition have never at any time either been asked to give, or have given, any explanation of their conduct.

THE PRESIDENT: Of what conduct?

Mr. GIBSON: The conduct of accepting the Conditions, which are contrary to the Regulations of the Institute.

THE PRESIDENT: This is the first time that it has been called in question. You must allow me to say that you have had nearly six months to bring up this question, and you have delayed doing so until now.]

Mr. GIBSON (continuing the reading of his Paper) : I will not much longer detain you except by very briefly referring to the other matters in the Instructions, which go to prove that this whole competition has been conceived in a parochial and unworthy manner.

The Instructions may be said to indicate that the L.C.C. intend to form a gigantic concrete raft or tank upon which the buildings are to be erected, and that this raft or tank is to be constructed from the designs and under the control of the Official Architect or Engineer, and that the successful architect shall not be paid one penny in fees on the cost of this work, which must involve many thousands of pounds' expenditure. It is rather puzzling to me to see how the special aptitude in matters relating to internal economy, building construction, and stability can be successfully employed in designing and constructing such a raft without any information from the author of the successful design as to the varying loads, weights, and requirements of his design; but the possible misuse of many thousands of pounds' worth of concrete, asphalt, and digging is perhaps as nothing compared to the saving of the architect's 4½ per cent., or the taking from him of a part of his work which all real architects are proud to do, and, I would venture to say, are as capable of doing successfully as any Official Architect or Engineer.

I do not like this attempt to take away from architects any proper part of their legitimate work, whatever may be the motive at the back of it; but I am quite willing to forego any such secondary matters as these if the Official Architect had advised his Council that equity to all parties demanded the immediate appointment of three Assessors who should act throughout the Competition, and that he himself be either Assessor or joint architect, but *not* both. Had he done so, I am certain he would have ensured a magnificent response to the invitation to submit designs; he would have gained the respect and esteem of all members of the profession, and have done justice to his fellow architects, and have given a loyal support to the Regulations of the Institute of which he is a member. I fear, however, that he is not likely to do any of these things; therefore we must decide to-night whether members of the Institute are to condone the violation of its Regulations, or call upon the seven members who have been invited to submit designs to refrain from taking any part in the Competition, and I trust all members of this Institute will cordially support them in such action, and will also in such case refrain from competing until the Conditions are amended to conform with our Regulations.

It may be plausibly urged that there is little time now to get these Conditions altered; that many men have been hard at work for weeks on their designs, and such like reasons for doing nothing; but let me say it is never too late to right a wrong. The delay of a few weeks or a few months in the reception of the designs by the L.C.C. is as nothing compared to the immense injury which you will be doing the whole architectural profession if you allow this to pass unchallenged. The answers to the questions asked by the competitors have only been issued ten days ago, and so no one can allege that any great amount of profitable work will be thrown away if a delay in the reception of the designs is now decided upon; but a very serious permanent injury will be inflicted on the whole profession if you do not take a firm stand on this matter. This will be cited as a precedent in future competitions, and before many years have passed the local architect or surveyor to the public bodies promoting competitions will be made joint architect, and the power and authority of the real architect will be still further taken from him.

I would make a personal appeal to the seven invited architects who are so closely concerned with this matter. You have the solution of the whole business in your own hands. If you stand together and are loyal to the Institute and to your fellow architects; if you desire to preserve the

integrity of the future conduct of public competitions; if you wish to retain the esteem and regard of your *confrères*, retire at once from this Competition and have nothing to do with it until the Conditions are such as all members can accept, and we shall support you with whole-heartedness, and take up a like position.

Mr. GEORGE HUBBARD, F.S.A. [F.], asked if the President would allow to be read to the Meeting the correspondence which he understood had taken place between the Institute and the London County Council. The more facts the Meeting had before them the better chance they would have of coming to a right judgment.

Professor BERESFORD PITE : May I ask if Mr. Gibson has moved a resolution? What is the business before the Meeting?

THE PRESIDENT : No, he has not moved a resolution.

Professor PITE : Is there any business before us?

Mr. GIBSON : Yes, a discussion of the Conditions.

THE PRESIDENT directed the Secretary to read to the Meeting the following correspondence :—

From the Secretary R.I.B.A. to the Clerk of the London County Council.

26th March 1907.

SIR,—I am directed by my Council to write you on the matter of the Conditions of the Competition for the New County Hall.

In a report of the proceedings of the London County Council, dated 5th February, it is stated therein that the "Conditions of the Competition have been approved by the R.I.B.A.," and my Council beg to direct your attention to the fact that the Conditions of this Competition have never been submitted to their consideration.

The attention of my Council has now been drawn to Instructions Nos. 8 and 9, which define the relations of the architect whose design is ultimately adopted to the Official Architect of the London County Council.

These provide that the Official Architect is to have "discretionary power in all matters relating to internal economy, building construction, and stability," while he is to have conjoint authority with the architect in superintendence and in certifying for payments.

My Council recognise the wisdom and reasonableness of a provision that the Official Architect should be consulted on matters relating to the work of the Council in the building, but feel that it is against the public interest that any part of the responsibility of the selected architect for carrying out the whole building which he has designed should be withdrawn from him.

They therefore urgently press upon the consideration of the County Council that Instructions Nos. 8 and 9 should be amended so as to appoint the successful competitor as sole architect, and to provide that Mr. W. E. Riley, the Official Architect, may act as consulting architect.

I am instructed further to point out that there is a well-established principle of the Royal Institute, binding on all its members, that no Assessor shall accept the appointment or act as architect to carry out a building on the designs for which he has to adjudicate. This rule has obviously a sound basis in the public interest, and my Council submit it as a further weighty ground for the amending of the Instructions in the sense suggested.—I am, Sir, your obedient servant,

W. J. LOCKE, Secretary.

From the Clerk of the L.C.C. to the Secretary R.I.B.A.

14th May 1907.

SIR,—In reply to the letter dated 26th March 1907 from the Council of the Royal Institute of British Architects suggesting the amendment of certain clauses in the Instructions to Architects taking part in the Competition for

designs for the proposed new County Hall, I am directed to assure you that the Instructions were the outcome of most careful and prolonged consideration by a Committee of the Council and subsequently by the Council; and throughout the several stages of their consideration the Committee had the advice and assistance of an architect of the highest standing. The Instructions were approved by the Council so long ago as 5th February 1907, and previously to the receipt of your letter of 26th March the Council had not been favoured with any observations from the Royal Institute. The Committee consider that the Instructions as now drawn will best secure a good building well adapted to the Council's purposes, and in these circumstances, and also having regard to the fact that the competition has been in progress several weeks, the Committee regret that they cannot see their way to recommend the Council to make any material alteration in the Instructions as they at present stand.—I am, Sir, your obedient servant,

G. L. GOMME,
Clerk of the Council.

Mr. Wm. Woodward [F.] said it would be much to be regretted if the Meeting terminated without some few observations on the reverse side of the question to that brought forward by Mr. Gibson. Mr. Gibson said that this was a matter of public policy. But wherein would the public suffer from the attentions and from the skill which would be brought to bear upon the building by a man who, above all others, was so competent to act at the side of the architect who would be appointed to carry out the building? Mr. Gibson had said that these Conditions were not "fair and honourable." He (Mr. Woodward) had read those Conditions very carefully from beginning to end; he had read pretty well the whole of the correspondence which had taken place between the Institute and the London County Council, and all he could say was that throughout the L.C.C. Conditions of Competition there was not a single item, there was not a single condition, which could be said to be unfair or dishonourable. Mr. Gibson complained about the appointment of two Assessors in the first instance instead of three. They knew, however, perfectly well that one Assessor was quite as good as two, and even better than three. Therefore he attached very little importance to that point. But they had had a precedent for this particular case, which had afforded the very best results, in the happy collaboration of the Office of Works with Mr. Clyde Young in the completion of the new War Office according to the designs of Mr. William Young; and in the other Government buildings in Parliament Street, the design of the late Mr. Brydon. In his opinion the term "joint architect" was a misnomer. Mr. Riley never intended to act, and it was not intended by the County Council that he should act, as "joint architect," as they understood that term. A joint architect was a man who from the commencement to the completion acted with his fellow architect and received half the commission. However, they were not dealing, he hoped, entirely with the matter of pounds, shillings, and pence; they were dealing with a big principle, and therefore the question of commission, whether half, or a third, or whatever it was, did not necessarily come in. With regard to the Assessorship, the Council of the Institute in 1906 knew perfectly well that Mr. Riley was to act as Assessor in this competition. They knew perfectly well that they had done the right thing in suggesting or being party to Mr. Riley's becoming the Assessor in this competition, in the same way as Sir John Taylor and Sir Henry Tanner had acted as Assessors in the case of the War Office and other public buildings with the most splendid results; and he anticipated that equally satisfactory results would accrue from this competition for the County Hall. Mr. Gibson complained that these Conditions were not laid before the Institute. It was quite true that the Conditions word for word were not laid before the Institute, but the

Conditions issued to competitors were practically the same as those suggested by the Council of the Institute. Mr. Gibson complained of the change of scale as being one of the variations from the suggestions made by the Institute Council. The scale adopted now was $\frac{1}{16}$ inch to the foot. He could see no ground for complaint on that score. He believed it was pointed out in the professional papers that the scale first suggested was too large for the ordinary size paper, and the London County Council had therefore reduced the scale to $\frac{1}{16}$ inch. Then Mr. Gibson said—and this was the whole crux of the thing—that Mr. Riley was "practically" joint architect. That word "practically" was a very useful term if one wished to draw red herring across the scent of one's opponent. Either Mr. Riley was the joint architect or he was not. There was nothing to show that there was any intention on the part of the County Council, and there was no idea in the mind of the Council of the Institute, that he should be "joint architect." His duties were to be more of an advisory nature. If the architect of the work proposed to put a room at the north-east that should be at the south-west Mr. Riley would say, "No; those two officials are in constant communication; they should be quite close to each other." That was where the assistance of Mr. Riley would come in; and that was where the architect of the building would find a great benefit accruing from Mr. Riley's connection with the work. What objection could there be in relieving the architect from these difficulties? The result of not having a Mr. Riley was shown in the Foreign Office and other public buildings, where the planning had proved most inefficient for the purposes for which it was intended. It was to obviate that difficulty that the appointment of Mr. Riley was suggested. He had never heard it stated, or even suggested, that Mr. Riley forced himself into the position. He did not know that Mr. Riley had ever suggested that he should hold it; but he did know that if he were a member of the London County Council, knowing what he knew of the mistakes made by eminent architects in planning, he should be the very first to suggest that a man in the position of Mr. Riley would be of the utmost value for the successful administration of the building, having in view the purpose for which it was intended. The planning for the successful administration of a great department—that was the point to be considered in regard to these Regulations. Mr. Gibson laid great stress on the Regulations issued by the Institute with regard to competitions. But with regard to Regulation 3, Mr. Riley could in no sense be said to fall under that regulation. It could only be by a stretch of the English language and by a stretch of imagination that Mr. Riley could be said to be both Assessor and joint architect. Mr. Riley was not joint architect, because he had to report to the London County Council, his employers, if any question should arise. Mr. Gibson had referred to the proposed foundations, and had mentioned the question of commission. He had already said that he trusted this matter would not be judged entirely upon the question of commission. He thought it was a very good suggestion on the part of the London County Council, because if they started the work it would enable the building to be completed more quickly, and the architect selected to carry out the work would find a foundation provided for him; he should say he ought to be very well satisfied in having the foundation of such a site as that provided at the risk of the London County Council itself. Many architects, eminent as they might be, would be very pleased to be relieved of that risk, even at the sacrifice of a part of their commission. In the R.I.B.A. letter of the 26th March the words "Consulting Architect" were used, and it said that no Assessor should act as architect. He had given as much consideration to this subject as Mr. Gibson had, and he hoped members would give him credit for understanding what he was talking about; he did not hesitate to say that Mr. Riley's position was one which would be of especial benefit to the public, and of the

greatest possible use to the architect employed to carry out the work. The endeavour to upset these Conditions now was to be regretted. The Conditions had been sent out practically with the assent of the Council of the Institute, and at this late date it would be unfair to Mr. Riley to attempt to alter them. Supposing they induced the London County Council to alter the Conditions, to eliminate Mr. Riley's name from the position of Assessor and term him "Consulting Architect," what difference would it make? A consulting architect on a building of this sort was a man who would be consulted on every occasion where the architect of the building desired his opinion and the benefit of his knowledge and experience; and this was exactly the position the County Council intended Mr. Riley to occupy. It would be most unfortunate in June 1907, after the months which had elapsed since the Institute as a body knew the general tenor of these Conditions, that they should take any action to get them altered. The London County Council had been guided only by one principle—viz., to adopt in the main the outlines of the Conditions suggested by the Council of the Institute. He trusted that there would be no attempt on the part of a small dissatisfied section of the 2,000 members of the Institute to upset conditions which had been made in a fair and honourable manner by the London County Council.

Mr. THOMAS BATTERBURY [F.] protested against the use of Mr. Riley's name. In his opinion his name should not have been imported into the discussion at all. He should have been referred to as the Superintending Architect of the London County Council. Otherwise it became a personal matter.

Mr. H. V. LANCHESTER [F.] said he thoroughly agreed with Mr. Woodward as to the assistance the Official Architect would be to the architect of the building. That assistance partook of the nature of the instructions of a client. But that would be quite different from the assistance that would be given by one acting as joint or as collaborating architect. It was with very great regret that he found himself in opposition to many of those who worked so well to secure the position of the Institute, and to whose efforts was owing the fact that it was now generally admitted that the views of the Institute Council carried great weight in the matter of what was fair between the public and the architect. His regret was the greater because he was certain that all concerned in the present question had acted with the firm belief that their procedure was dictated by the best interests of both the public and the profession. He felt that no architect ought to stand quietly by and see it tacitly assumed that an architect capable of success in a competition such as this could by any possibility be incapable of solving any problem of arrangement or construction that was fairly and squarely put before him. In a question of the instructions of a client to his architect, he was sure that in most cases where there had been failure in such matters it had not been because the architect was unskillful, but because he had never been given proper instructions. The instructions given to an architect were often very faulty, and sometimes it was difficult for him to realise what was actually wanted. In the present case there was no question that every facility would be given for realising what was wanted, and that was what the architect was entitled to. The architect must fulfil the clearly stated requirements of his client. The client—in this case the London County Council, with the aid of its professional advisers—might define the requirements; but to produce the best building, the best methods of fulfilling those requirements, must be for the architect, and for him alone. With regard to the Conditions objected to, he felt sure that the divided authority and responsibility must militate against the production of a really great work. If the Institute were united on this point, the London County Council could not fail to grasp the force of its protest, it being obvious that as paymaster it possessed all the necessary control. It had been suggested that this was a narrow-minded fight of the Institute

versus the public. Even if it were, the Institute must protect its members against oppressive conditions. But it was not; it was quite clear that the public would suffer quite as much as the architect by these mistaken arrangements. He hoped they would come to a conclusion without any formal resolution; but if any formal resolution were moved he hoped they would all support it. The London County Council had its professional adviser, and had absolute power through him to instruct the architect to carry out every requirement; but the architect must have freedom to carry out those requirements in his own way.

Mr. H. HEATHCOTE STATHAM [F.] said he could not help thinking that some part of the dissatisfaction that had been expressed with regard to the position claimed for Mr. Riley was based on an unfortunate reading of the County Council's document. The County Council, as had been said, was in the position of a client instructing his architect; but being a very large and multifarious body they required a competent mouthpiece to give their instructions. The small commission proposed for the County Council Architect seemed to favour the supposition that he was regarded as the mouthpiece of the client. He thought that what had been objected to really only arose on the interpretation of the wording of the Conditions—and that interpretation was very likely not what the framers of the Conditions intended. He thought it quite reasonable that the Council should desire their own professional representative to express their wishes as to the arrangement of the building. He wanted, however, to draw attention to another point which he thought one of the most important of all, but which was treated rather as a secondary point in Mr. Gibson's remarks—viz., the question of the scale of the drawings. It was, as far as he knew, quite inaccurate to say that it had been represented to the Council that their scale was too large, and that they had reduced it. It was represented to the Council in the Press that the one-sixteenth scale was too large, and they shortly afterwards issued, as a sort of appendix to one of their reports, a statement that no consideration as to the alteration of scale could now be taken up; that it was too late, or something to that effect. He was quite sure that the one statement was the result of the criticism. He had made from curiosity—for he had no intention of going into this enormous lottery himself—a little experiment as to what the building on the one-sixteenth scale would cover. He made out that if one worked on loose paper without glueing it down, one could just get it on to an antiquarian sheet; but if the drawing were strained and glued down, the antiquarian sheet would be too small. Although the one-sixteenth scale in ordinary competitions was considered a merciful and small scale, with a building of this enormous area, one might almost say that the one-sixteenth scale was a working scale. At all events, as Mr. Gibson had suggested—although he did not emphasise it as he might have done—it came to this, that if the large scale were adopted the plan had to be worked out in detail, instead of its being the expression of a great architectural idea. If they could only persuade the promoters to take a smaller scale, it would be to the advantage of the competition, the object of the competition being to get out something really fine in the way of architectural conception. They all knew that it was much easier for the real man, the principal in the thing, to do that if he had to work upon a scale which he could handle himself without being necessarily dependent on the assistance of a large staff. He was afraid, however, that it was too late. If the Meeting thought that any representation would induce the County Council even now to reduce the scale of the competition, that would be a very important change for the better; he thought, indeed, they would be quite justified in trying to bring that about. It seemed to him that that was more important than this question about professional etiquette. It had been, he thought, more a matter of unfortunate wording than of any unfortunate intention.

Mr. HUBBARD said there had been no serious loss of time either on the part of the Council or of the Institute. The Conditions were only posted in February. The Council of the Institute objected to them in March, and it was only within the last fortnight that the London County Council had replied to the letter of the 26th March. The Institute in this matter ought loyally to support the Council. The Council had objected, and it was for this Meeting to stand by the Council and support them as far as possible.

Mr. GIBSON said he should like to reply to one or two of the points that had been raised by the other speakers, and then with the President's leave he would move a resolution.

Professor BERESFORD PITE [F.] : Will you read the resolution first?

Mr. GIBSON : I want to reply to the points raised by the other speakers.

THE PRESIDENT : You will have an opportunity of replying. We had better have the resolution first.

Mr. GIBSON said he proposed to lay before them the following resolution : "That a notice be immediately published in the JOURNAL and in the professional papers stating that, until the Conditions and Instructions governing the Competition for a new County Hall for London are brought into conformity with the Regulations of this Institute, all members are prohibited from taking any part in such competition; and that a copy of this resolution be sent to the London County Council." It had been mentioned from the Chair that a long time had elapsed since these Conditions were issued, or had been under consideration, and that it was only at this very late hour that they had been brought before the members of the Institute by some other members besides himself. For many months, however, in fact ever since the Conditions were issued in printed form, an endeavour had been made through the Committees of the Institute and through the Council of the Institute to get those Conditions amended. The reply to those endeavours had only just been received, and it was for that reason that it had now become imperative for the whole of the matter to be laid before members, and for the members to come to a decision upon it. It could not have been done before in justice to the Council. It had been done at the very earliest possible moment. With respect to the point raised by Mr. Woodward as to "collaboration" and the use of the words "practically joint architect," that was quite beside the point. Mr. Woodward's arguments showed that he entirely missed the point of the objections he (Mr. Gibson) had brought before the Meeting. He cited as an instance of "happy collaboration" the War Office and the late Mr. Brydon's building. Mr. Woodward must know that neither for the War Office nor for Mr. Brydon's building was there ever any public competition. It was quite within the discretion of the late Mr. Young or the late Mr. Brydon to enter into any terms that they thought fit as to collaboration with Sir John Taylor or any other architect. That was a matter they had no right to interfere in at all. With reference to an objection raised by a previous speaker, he should like to explain that he did not want to introduce the name of Mr. Riley into this discussion. He should have kept very carefully to the term "Official Architect" if he could have done so. The first time he had mentioned Mr. Riley's name was in a quotation from Clause 8 of the original Conditions, in which the name was specifically mentioned. He could not help it. He was quite willing, because he had every respect for Mr. Riley, to refer to him only as the "Official Architect." He should like to say that he heartily endorsed all that Mr. Woodward had said as to the immense value of the help which the Official Architect would be able to give to the successful competitor; but that was not the point. The point was this: the Official Architect should not be an Assessor and a consulting architect or a joint architect as well. He should be delighted with Mr. Riley as joint or consulting architect and not Assessor; but why he should wish to take up a position which was entirely contrary, not

only to the Regulations of the Institute, but entirely contrary to the proper conduct and purity of public competitions, was beyond his comprehension. He had hoped that the seven invited architects would have condescended to give them some explanation that evening as to why they accepted this position, or whether they were aware that the Official Architect was to be Assessor and collaborator or joint architect as well. He was not aware that they did know it when they accepted that invitation; he had a very great suspicion that they knew nothing of the kind.

THE PRESIDENT : Yes, they knew it; it was in the JOURNAL.

Mr. GIBSON : If that was the case then he considered that they owed the members of the Institute some explanation of expediency or special circumstances, or some reason why in this particular instance they should depart from a regulation which was so clearly worded and so simple, and which was to the interest of the whole architectural profession. He would conclude by only stating that they had heard that at any rate on the 26th March the Council of the Institute in their letter to the L.C.C. were of opinion that there was a well-established rule binding on all members that no Assessor should compete or act as architect for the building the subject of the competition he was assessing. The Council of the Institute had taken a perfectly sane and logical view of the whole matter on the 26th March; and it became the duty of members to support them by carrying, he hoped unanimously, the resolution he proposed, which practically put the Competition on the same footing on which every other competition in this country ought to be put. He believed that if this resolution were published as he proposed, they would have the hearty support of the whole of the members of the Institute; that they would loyally refrain from competing until the Conditions were amended; and that they would do everything they possibly could to show that, as professional men, they valued their honour, they valued the position of the Institute in the architectural world, and they valued the fact that the Institute had done something to safeguard their interests and the interests of architecture.

Professor BERESFORD PITE asked the Chairman's ruling on the point as to whether the resolution could be brought forward. Notice had now been given of a definite resolution which would bind members of the Institute in definite terms. The intention of that motion was to prevent all members of the Institute from competing. He was not discussing whether the motion was advisable or not, but that was what Mr. Gibson intended. Notice of such resolution ought to have been sent to all the members of the Institute. That had not been done. This discussion might have some useful end or not, but he did not think it could end in that resolution—at any rate on the present occasion.

Mr. H. W. WILLS [A.] said the motion was simply to affirm a general principle laid down by the Institute, and it was a principle which hardly ought to be called in question. In the face of Clause (c) of the requisition there could be nothing out of order in bringing forward the resolution that Mr. Gibson had moved, and which he should be most happy to second.

Mr. WM. WOODWARD said he thoroughly agreed with Professor Pite. This resolution affected 2,000 members, and it was absolutely necessary that notice of it should be sent to every member of the Institute.

Mr. HUBBARD : The effect of this is simply to compel 2,000 members of the Institute to comply with their own Regulations.

Mr. G. A. T. MIDDLETON [A.] : There is no doubt that notice ought to be given, for this is a very big motion. It is a prohibitory motion. It is not merely a question of the standing of the profession, but a question of a trade union.

THE PRESIDENT pointed out that by by-law 56 "notice of any motion intended to be submitted to a Business Meeting must be given to the Secretary at least fourteen

days before the date of such meeting." By-law 60, however, which dealt with Special General Meetings, made no mention of any such notice of motion.

Professor PITT said that, according to by-law 60, a Special General Meeting must be called for a specific purpose. The specific purpose was not stated in the notice. The requisition was for a meeting to consider the Conditions and Instructions, and the action taken by the Institute and Council, but it did not specify a prohibitory motion. Could Clause (c), which said, "To propose any resolutions which may arise out of the subjects dealt with under Clauses (a) and (b)," be possibly taken to cover this resolution? The resolution was of so drastic and important a character that he claimed a ruling that would submit it to every member of the Institute. He himself had come to the meeting in ignorance of this resolution, and the vast majority of members must be in the same position. The by-law was explicit, that the specific purpose of the meeting must be stated in the notice convening it.

THE PRESIDENT, after consideration, ruled that the resolution was in order, and invited discussion upon it.

Mr. HENRY T. HARE [F.] said he felt some little diffidence in addressing the Meeting on this matter, because he had the honour to be one of the architects who had received the invitation of the County Council to take part in this competition; but to some extent he felt bound to say something. He ought to explain, however, that he had no authority to speak for the other architects who had been invited to compete, though he believed that what he should say as to their views represented very fairly their opinion about these Conditions. Mr. Gibson they all respected most highly; they were all ready to acknowledge that his motives in bringing forward this resolution were entirely, from his point of view, for the benefit of the profession at large. No one who knew Mr. Gibson as he (the speaker) knew him could hold any other opinion. He thought, however, that in this case Mr. Gibson had taken a mistaken view. In the first place it had been stated that no delay had occurred in making this protest against the conditions of the competition. It had been stated that the instructions with regard to the competition were issued late in February, that the Institute protested in March, and that they only received the reply to their protest last week. That really did not quite accurately represent the facts of the case. The County Council published last July a statement to the effect that this competition was to be instituted on certain lines. It gave those lines in exactly the way in which the Conditions were subsequently framed and published. It stated distinctly that the architect to be appointed to carry out this work was to act in collaboration—that was the word used—with the Architect of the County Council. That notification which was public property last July was, he believed he was right in saying, a long time previous to any intimation given to the architects who were subsequently invited to compete; and therefore they had, or ought to have had, knowledge that that very material condition was to be one of the conditions to which they were to submit themselves.

Mr. A. W. S. CROSS [F.] asked if in that preliminary notice any intimation was given that the Superintending Architect was also to be the Assessor?

Mr. HARE said that was another question altogether, which he would deal with afterwards. It simply stated that the Official Architect was to act in collaboration; so that the knowledge of the Official Architect's position was public property from the middle of last year, and no protest was made by anyone against it. Then with regard to the dual position of the Official Architect as one of the Assessors and as collaborating architect, it had been stated that the position was in contravention of the Regulations of the Institute. In the first place, he thought the word "Regulations" too strong a term to use, although he was aware that the paper containing the suggestions of the

Institute was headed "Regulations." The document had only been so styled within the last year or so; previous to that it was regarded as suggestions merely, not hard-and-fast rules to be binding in every case. But with regard to this particular clause in the document, that no Assessor should act as architect in the work he was assessing, he thought that all their regulations and suggestions ought to be regarded from a commonsense point of view. They ought not to take the letter without the spirit of the law. As regards this Clause 3, anybody who thought for a moment would see what was the motive which underlay it, and which prompted the putting forward of such a very important suggestion in the conduct of competitions. When the Assessor was appointed in the initiatory stages of a competition he would meet his committee and discuss the thing with them; he would have the ear of the committee all through the conduct of the competition, and they naturally would have considerable confidence in any opinion he put forward and in any advice he gave. He was in a privileged position, and had every opportunity in that position—and anyone who had acted as Assessor would fully appreciate the justice of what he said—if he liked to use it, of influencing the committee in his favour. He could always induce the committee to take his view of anything; and if he were at all influenced by corrupt motives he could with very little trouble induce the committee to place him in the position of architect. That had actually occurred in some cases: the competition and its results had been thrown over altogether, and the Assessor himself had been appointed architect. In other cases he had acted as joint architect; so that there was no question that he was in a position in which he could use his influence to the detriment of the whole of the competitors. That was the reason why this clause was put, and very properly put, into their Regulations for the Conduct of Competitions. In the present case, however, it was stated before the competition was initiated that one of the Assessors was subsequently to collaborate with the successful architect. This position being defined from the very beginning, how was it possible for the Official Architect to use his position to the detriment of any of the competitors? To his mind it was inconceivable, and he thought he was correct in saying that that was the view of the gentlemen, at all events of seven of the gentlemen, who had received the invitation of the County Council to take part in the competition. That was their view as to the dual position of Mr. Riley. As to his position as collaborating architect, apart from his position as Assessor, all he would say was that they would consider themselves very fortunate in having his assistance if they were appointed to carry out the work. There was likely to be some misunderstanding as to the position of the Council of the Institute in respect of the letter which had been written. He had no authority at all from the Council to make the remarks he was going to make about it, but the fact of the Council having written the letter which had been read might give an idea that the Council took up a position equally as strong as the one Mr. Gibson had taken up. That, he believed he might say, was not the case. The Council, he believed, took pretty much the view that the invited competitors took as to Mr. Riley's dual position. The question was discussed at the Council. Some of the members felt that there were certain things in the Instructions which were open to objection; and the Council, being anxious to meet the views of all parties, wrote that letter to the County Council. It was an attempt really to meet the views of all parties. If it had been possible to make some modification in the wording which would have obviated all objection it would have been a very fortunate thing, and they should have congratulated themselves upon it; but, as that had not happened, it seemed to him that it was much too late now for any action to be taken debarring members of the Institute from taking part in this competition. It was now

three or four months since the Instructions were issued, and competitors must be very far advanced in the preparation of their designs. He considered it would be most unreasonable for this Institute, or for anyone, to ask competitors to throw away the labour of months without any adequate reason. There was, at all events, a considerable division of opinion as to whether these Conditions were satisfactory or not; and, in his opinion, it would be most unjust for one section to attempt to impose their will on the other section, having regard to the fact that so much labour must have been already expended on the competition.

MR. JOHN SLATER [F.] said he should like before the resolution was put to the vote to try to raise the question to some higher ground or higher footing than seemed to have been considered so far. To him personally the matter had no interest, but he had been for a great many years a member of the Institute, and he had had something to do with the control of its affairs; and he would like the Meeting to consider whether the real *motif* for the existence of the Institute at all was not as laid down in the Charter originally in these words, that its members were to be associated together "for the general advancement of civil architecture, and for promoting and facilitating the acquirement of knowledge of the various arts and sciences connected therewith." That was their original Charter, and he seriously asked the Meeting to consider whether they should not be putting themselves in an extremely false position, whether they should not almost make themselves a laughing-stock, if they attempted to coerce their members in this way on a matter upon which, as Mr. Gibson and Mr. Hare allowed, there were differences of opinion. If they did that they would be lowering the Institute to the basest of trade-union purposes. It was not only the seven gentlemen who had been invited to send in designs, but there were a large number of others who must be preparing designs. How anyone could say that a motion of this kind was to advance architecture, or to be of the slightest use in promoting architecture, he could not conceive. Mr. Gibson said that if they passed this resolution they would have the matter in their own hands. Did anyone believe that if this resolution were passed the County Council would knuckle under to it? If he were the County Council he would say, "Very well; if you do not choose to compete, let our own architect do it." What would be the advantage of that? He was not for a moment suggesting that Mr. Riley could not do it, but he was pointing out that that would be the natural result of such a motion as this. As it had been the policy of the Institute throughout to try to keep the competition on broad lines, and on lines that the Institute suggested, and that had, on the whole, been acceded to by the County Council, to pass a motion like this would be to stultify themselves and negative all that they had done, and do more harm than good. He asked the Meeting most earnestly to consider those points before they passed a resolution of this kind.

MR. W. E. RILEY [F.] said he thought the Meeting would agree with him that his position in having to address them that evening after listening to that debate was one which required a good deal of self-restraint. He had not come into the room with any intention of speaking, but there had been so much misconception, and so many vague ideas had been put before the Meeting, that he was convinced he might spend a few minutes profitably to them by giving the facts of the case. He claimed first of all that he deserved the co-operation of members of the Institute, and not their mastership. He was present as a member of the Institute to advocate a proper and a just cause; and if he had to take their mastership it must be a just, and not an unjust and domineering mastership. The mover of this resolution had mentioned the fact that the Institute had first approached the County Council offering advice or assistance in the matter of obtaining designs for the proposed County Hall. The letter from the Institute was dated

the 3rd April 1906, and the moment that letter came into his hands he put it before his Committee, with the intention that they should understand the full meaning of the Council's request that the competition should be placed in a proper manner before the public. On the 28th July 1906 *The Builder* gave a general indication of how it was intended that this competition should be placed before the public. He asked them to remember that date—28th July 1906. In the general idea given in *The Builder* of what was intended the word "collaborate" was used. But in the Conditions as issued nothing was said as to his acting as collaborator or "joint architect," and he knew it was not the intention of the County Council to make him joint architect, as seemed to be apprehended. With that before them, he asked them to consider whether this resolution would have any effect at all, or do any good whatever to their cause. There was a strong feeling, perhaps, that he was the author of these Instructions. He might tell them at once that he was not. The Establishment Committee sought what they thought was the best advice they could get, and every clause was drawn up after the fullest consideration. On the 22nd December last year the Institute had on their Library table a full print of these Instructions as issued, the only subsequent alteration being that the time for sending in the designs was afterwards extended. It was extended, they would remember, owing to their own resolution of the 7th January last. There was a minor detail beyond that; but the main point was that the Institute desired the time to be extended. They got their way; but how did they get their way? They got it a good deal by his advocacy of their views when they were not present to speak for themselves. If they passed this resolution what would his position be? Had it not been advertised before the whole world? The Institute Council had approached the County Council; they had not consulted him. Why not have consulted him as to whether he wanted to be an Assessor before recommending him for that position? He did not covet the position of Assessor. It was a very barren honour. When he was appointed one of two Assessors on the Strand Competition in 1900, and after the joint report had been published in 1902, he found, when the subject was referred to in the Institute JOURNAL of 8th November 1902, that his co-operation in that great question was entirely disregarded. In such circumstances he thought that any endeavour to ascribe undue importance to the consequences of his being an Assessor on the County Hall Competition was insincere. He had had no word of acknowledgment although he had striven hard to help the Institute in the matter of the Strand Improvement. That, he would tell them, was where their work lay. London was being built up by the street, by the mile, without effective guidance. That was where they could step in and do good. Were they doing it? He had, single-handed, succeeded in getting the resolution before the County Council to have those who were named in the Assessors' report employed on the Strand Improvement. He had had one letter, he believed, supporting that from the Council of the Institute. Was he entitled to have their co-operation and their assistance? He gave his loyalty to the Institute, and he expected theirs. Now, with regard to the County Hall Competition. The Institute Council, first of all, intimated that he ought to be one of the Assessors. They did not know at that time probably that this was intended to be an international competition. That phase of the question had not been touched upon so far. An international competition, it must be remembered, might bring anyone in. The idea was to unearth a genius; and did they suppose that if they unearthed a genius the County Council would allow a possibly unknown architect to go unfettered in fixing for all time the internal economy of the County Council building? With regard to precedent, they had discussed in that room the question of Liverpool. The reason assigned in the Liverpool Competition was that the architect whose design

was selected was too young to carry out the work. There was no limit of age in the County Hall Competition. He had a business committee and a business community to deal with, and they were faced with two facts. One was that there was no limit of age, and another that they might have man from any country and of any nation. He was in thorough sympathy with the Institute when they in that room on the 7th January expressed a strong opinion that it ought not to be an international competition, but a competition for British architects. But that was a matter upon which he had no voice. He did not believe that one of them thought for a moment that he would act unfairly in this matter. He asked them to realise what would be the effect on his position hereafter of their passing a resolution such as Mr. Gibson had proposed. It would stultify him for ever. At the meeting of the 7th January, when these Instructions were fully public, there was not a single word of criticism on the points now raised. They knew then the dual position he was to occupy; then why not at that time have said at once, "We object to this dual position"? The Instructions were not approved then; and it would have been a simple thing for him to retire from the assessoryship, and he would have been quite willing to do so. They all remembered the legend of Milo endeavouring to correct the simple science of the woodman: he found the tree with a wedge in it, and over-confident in his strength he removed the wedge to tear the tree asunder; but the tree closed on his hands and held him until the wolves devoured him. Might not such a Nemesis come upon them? He thought they were in very great danger, if they supported a resolution of this kind, of having any proper representations that they made, and made with good effect, to local authorities so discounted before receiving consideration that they would lose nine-tenths of the influence they possessed at the present time. He asked them in all sincerity not to persevere with this resolution. He asked Mr. Gibson to consider the other side of the case, and to go heartily into the competition.

Professor BERESFORD PITE appealed to Mr. Gibson to withdraw his resolution. The resolution had not really been considered in its tremendous effect—an effect which, he thought, even Mr. Gibson had not fully measured in his mind—and he could not see, under the circumstances, that the carrying of the resolution would do any good to those who had promoted this discussion. He thought the discussion might have done a great deal of good in clearing from their minds misconceptions which had not been shared by all, but which, as Mr. Hare said frankly and candidly, had been shared by some. Let them be satisfied with that. After Mr. Riley's remarks and his earnest and candid appeal to the objectors for sympathy, his efforts on behalf of fair dealing in this matter, he felt sure, would be received heartily by them. The adoption of a resolution such as had been proposed, he ventured to think, rather hastily, and certainly without full notice, after Mr. Riley's speech would put them in a rather anomalous position. The atmosphere had undoubtedly been cleared to a great extent. He did not think that any of them could feel after this evening that there had been the slightest intention on the part of the County Council to jerry-mander the competition. If they looked at it from their point of view the arrangement they had made for their Official Architect to work in conjunction with the successful architect seemed a desirable one. He ventured to say that there was not the slightest hint in these Conditions of any desire by the County Council to rob the successful architect of the full credit of being the architect of the building. He challenged anyone candidly to read these Conditions and say that they were unfair to the architect as designer. There was no hint of conjunction or collaboration in the artistic design. The design was to be the design of the successful architect. That point out of the way, they came to the question of the Assessorship. It was, as Mr. Hare pointed out so

lucidly, an empty technicality to plead the Regulations for the conduct of other competitions. If the arbitrator submitted a design the difficulty aimed at by these Regulations was met. In this case there was nothing of the sort. He thought that for anyone who sat down and mastered these most elaborate and difficult schedules to have the advantage of an official to weigh and judge the plans was the best possible assurance that the profession could have of a fair and proper result. He appealed to Mr. Gibson to do them the favour to withdraw a resolution which did not commend itself to members. It would have to be endorsed by a two-thirds majority; then there must be a poll; and it would cause a great amount of discomfort to the whole profession and produce no good result.

Mr. GIBSON said that with respect to what Mr. Riley had been good enough to lay before them he had every sympathy. He did not doubt for a moment the integrity and uprightness of Mr. Riley. He was quite sure that any architect entering upon this competition might rely upon his design being judged in an able manner, and that all its points would be carefully weighed and assessed. That, however, was not the point. They proposed to accept one upright, honest man, a man of undoubted integrity, to act in the dual position of an Assessor in a competition and as collaborator, or at all events to assist in carrying out the selected design. He was convinced that by so doing they were opening the way for the same position to be taken up by every borough engineer and architect all over the country. There was not the slightest doubt about it. This would be cited as precedent. He entirely disagreed with Professor Pite as to the inconvenience and trouble and worry in which the carrying-out of this resolution would involve the Institute. The whole matter had been laid very clearly before the Meeting by both sides. They were entitled to express their opinion upon it. He could assure Mr. Riley and everyone else present that he had no intention of entering into a competition with regard to the County Hall or any other building the conditions of which were not in conformity with the Regulations of the Institute.

THE PRESIDENT said he had already drawn Mr. Gibson's attention to the fact that this matter might have been brought forward by the objectors six months ago. In the JOURNAL of the 22nd December the whole thing was clearly stated—the names of the eight invited architects, the terms of the competition, the Assessors, and every other material point. The members of the Council who had signed this requisition had had the opportunity long ago of bringing the matter up in the Council. No doubt they had done so on occasions; but if they felt it was such a serious matter as to warrant the summoning of a meeting of this kind, then they ought to have taken action at the first opportunity after the proposals were made known. He should like to point out that the Institute Regulation against an Assessor acting as architect for the work he was engaged to adjudicate upon was designed to prevent an Assessor subsequently to the determination of a competition being appointed as architect or joint architect. The only competition he knew of where an Assessor was so appointed was that of the Liverpool Cathedral. That case was discussed in that room, and it was subsequently shown that the appointment of a joint architect in that case was a perfectly right and proper arrangement under the circumstances. That case, however, was not on all fours with the present. It was known long ago throughout the whole profession that Mr. Riley was to be consulting architect. It was a mistake to say "joint architect." A joint architect would have to share half the responsibility and have an equal say in the designing of the building. It was perfectly clear in the Instructions that that was not the position the London County Council intended Mr. Riley to hold, and he was perfectly certain that that was not the position Mr. Riley himself intended to hold. When the question of the terms of the competition was being con-

sidered by the Council, with Mr. Belcher in the Chair, he (the speaker) was one of the members of the Council to propose that this should be an open competition. He made that proposition because he wished that the young men should have a chance. There could be no doubt that having Mr. Riley as Consulting Architect to the Council and as Assessor would be of the greatest help to any young architect whose design might be selected, because it was not to be considered that a body like the London County Council would entrust the expenditure of nearly a million of money to a young man, who might lack experience in the carrying-out of buildings. With the Conditions as they now stand a young man would be able to carry out this work with Mr. Riley as consulting architect just as well as if he had associated with him joint architect sharing half the fees. He thought that the young architects, at any rate, even if their seniors did not take that view, should very seriously consider it. If there were no consulting architect appointed at the present moment—supposing that Mr. Riley withdrew, or the Council withdrew him and left it an open question—the chances were that if a young man's design were selected the work would not be given to him unless he collaborated with men of older experience; and that would mean halving everything, not only the commission—which was not the principal thing to consider—but the credit and honour which the carrying-out of such a building would bring to the architect. With regard to changing the scale of the drawings, he did not think that that matter need have been brought up at all. Personally he preferred to do the one-sixteenth drawings, and he had had some experience in such matters. He should like to join his appeal to Professor Pite's for the withdrawal of the resolution. They ought not to lose sight of the fact that the Institute, as a public body, occupied a position of considerable responsibility. As the representative architectural body of the Empire, it enjoyed the confidence of the Government and of the London County Council, and had been able to exert its influence most beneficially on questions affecting their art. If, however, after having suggested and sanctioned a certain procedure some members of the Council took exception to them and repudiated the action of their colleagues, it would go out to the world that they were a divided body, and the Institute would lose a very great deal of the confidence that the Government and the County Council had been accustomed to repose in them. He therefore made a very strong appeal to Mr. Gibson and his supporters to withdraw their resolution.

The mover and seconder declining to withdraw the resolution,

Mr. FRANK LISHMAN [A.] asked if he should be in order in proposing the following as an amendment: "That this Meeting, having heard the remarks of various speakers, including especially those of Mr. Riley, and having regard to the opinion expressed from the Chair, considers that members of the Institute are entitled to take part in this competition under the conditions announced."

The proposal was not seconded.

Mr. A. W. S. Cross [F.] said there was one point he should like to mention before the motion was put. During the whole course of the debate not one word had been said as to why in this instance they were departing from the ordinary regulations governing the conduct of architectural competitions.

THE PRESIDENT said there must be exceptions to every rule. The London County Hall was an exceptional case altogether, and there was ample justification for treating it in an exceptional manner.

Mr. A. T. TAYLOR R.C.A. [F.] asked leave to move the following amendment: "That this Institute regrets that the terms of the competition are not satisfactory in every respect; but as a considerable time has elapsed, and many architects have been for some time at work on their designs, the Institute is of opinion that the competition

should take its course." A resolution in this sense would record their dissatisfaction with the arrangements, and might possibly meet the views of both sides.

The proposal was not seconded.

Mr. CROSS: At the time of the controversy as to Liverpool Cathedral the then President, Sir Aston Webb, distinctly laid it down that such an exceptional thing would never occur again, and here within the short space of three years it has occurred.

Mr. HARE: Mr. Cross, I think, is mistaken in saying that Sir Aston Webb stated that the case would never occur again. The question was discussed in this room, and the conclusion arrived at was that under the circumstances it was justifiable. In the face of that it could hardly have been said that it would never occur again. If the circumstances were the same the result would be the same, and everybody would wish it to be so.

The resolution, having been eventually put from the Chair, was negatived upon a show of hands, the President declaring the numbers to be 29 for the resolution and 50 against.

The Annual Elections.

The results of the elections, with the numbers polled, as reported by the Scrutineers, will be found set out in the Minutes of the Business Meeting last Monday [p. 559], when the Officers, Council, and Standing Committees were declared duly elected as follows:—

THE COUNCIL.

President.—Thomas Edward Collett.

Vice-Presidents.—James Sivewright Gibson; Edwin Thomas Hall; Henry Thomas Hare; Leonard Stokes.

Hon. Secretary.—Alexander Graham, F.S.A.

Members of Council.—Reginald Blomfield, A.R.A., M.A.Oxon., F.S.A.; John James Burnet, A.R.S.A. (Glasgow); Alfred William Stevens Cross, M.A.Cantab.; Edward Guy Dawber; William Flockhart; Ernest George; John Alfred Gotch, F.S.A. (Kettering); Edward Augustus Gruning; Henry Vaughan Lanchester; Edwin Landseer Lutyens; Charles Edward Mallows; Ernest Newton; William Alfred Pite; Andrew Noble Prentice; Halsey Ralph Ricardo; John William Simpson; John Slater, B.A.Lond.; Paul Waterhouse, M.A.Oxon.

Associate Members of Council.—Henry Arthur Crouch; William Curtis Green; Sidney Kyffin Greenslade; Stanley Hinge Hamp.

Representatives of Allied Societies.—Hippolyte Jean Blanc, R.S.A. (Edinburgh Architectural Association); Henry Dare Bryan (Bristol Society of Architects); Harry Sutton Chorley, M.A.Oxon. (Leeds and Yorkshire Architectural Society); John Francis Groves (Cardiff, South Wales, and Monmouthshire Architects' Society); Edmund Kirby (Liverpool Architectural Society); William Mansfield Mitchell, R.H.A. (Royal Institute of the Architects of Ireland); James Milne Monro (Glasgow Institute of Architects); Paul Ogden (Manchester Society of Architects); Arthur Benjamin Plummer (Northern Architectural Association).

Representative of the Architectural Association (London).—Walter Cave.

STANDING COMMITTEES.

Art.—Fellows.—Robert Shekleton Balfour; John James Burnet, A.R.S.A.; Edward Guy Dawber; Ernest George; James Sivewright Gibson; Henry Thomas Hare; Professor William Richard Lethaby; Edward Schroder Prior, M.A.Cantab., F.S.A.; John William Simpson; Paul Waterhouse, M.A.Oxon.—*Associates.*—John Anderson; Arthur Thomas Bolton; Thomas Davison; Sidney Kyffin Greenslade; Thomas Geoffrey Lucas; Edgar Wood.

Literature.—*Fellows*: Alfred William Stevens Cross, M.A.Cantab.; John Alfred Gotch, F.S.A.; Edward Schroder Prior, M.A.Cantab., F.S.A.; Halsey Ralph Ricardo; Professor Frederick Moore Simpson; Professor Ravenscroft Elsey Smith; Richard Phené Spiers, F.S.A.; Hugh Stannus, A.R.C.A.; Charles Harrison Townsend; Paul Waterhouse, M.A.Oxon.—*Associates*: William Curtis Green; John Humphreys Jones, B.A.Lond.; Herbert Passmore; Arthur James Stratton; William Henry Ward, M.A.Cantab.; Percy Leslie Waterhouse, M.A.Cantab.

Practice.—*Fellows*: William Henry Atkin Berry; Max Clarke; Alfred William Stevens Cross, M.A.Cantab.; George Hubbard, F.S.A.; Joseph Douglass Mathews; Sydney Perks; Herbert Arnold Satchell; Alfred Saxon Snell; Thomas Henry Watson; William Henry White.—*Associates*: Edward Greenop; Edwin Richard Hewitt; Herbert Hardwicke Langston; Horatio Porter, M.A.Cantab.; Thomas Edward Pryce; Augustus William Tanner.

Science.—*Fellows*: Harry Percy Adams; Thomas William Aldwinckle; Max Clarke; William Dunn; Matt Garbutt; Francis Hooper; Charles Stanley Peach; Herbert Duncan Searles-Wood; Alfred Saxon Snell; Lewis Solomon.—*Associates*: Robert John Angel, M.Inst.C.E.; Edmund John Bennett; Henry William Burrows, F.G.S.; Edwin Richard Hewitt; Ernest William Malpas Wonnacott; Ernest Alexander Young.

The Hon. Auditors are Messrs. Henry Philip Burke Downing [F.] and Arthur William Sheppard [A.].

The Scrutineers of the elections were Messrs. Arthur H. Reid (*Chairman*), S. D. Adshead, Charles B. Bone, John Cash, Bulkely Creswell, A. Blomfield Jackson, F. W. Marks, Herbert Read, A. H. Ryan-Tenison, Arthur Sykes, Percy B. Tubbs, *Fellows*; Messrs. A. C. Dickie, H. S. East, G. L. Elkington, A. W. Field, Harold Goslett, H. A. Hall, Thomas A. Pole, Herbert Shepherd, C. Wontner Smith, Stanley Towse, *Associates*. Seven hundred and forty-seven envelopes containing balloting papers were returned. The counting of the votes lasted from 10.30 to 6, Friday the 7th. The Scrutineers report that they had to reject for informalities eight papers for Members of Council, and twelve for Associate Members.

Suggested New By-Law authorising Poll to be taken on Requisition of Members.

At the Business General Meeting of the 10th inst., Mr. Herbert W. Wills [A.], in accordance with notice, brought up the following resolution—viz.: “That a clause be inserted in the Revised By-laws empowering the taking of a poll on any professional question on the signed requisition of twenty-five members of the Institute.”

Mr. WILLS read the following remarks:—

I move the resolution standing to my name with the object of supplying a final means of making the Institute more absolutely what it claims to be, the Royal Institute of British Architects. I am very far from underrating the great services rendered to the profession by the long line of distinguished architects who have occupied the Presidential Chair, services in which they have been loyally and fully seconded by the Council, which is yearly elected by the general body. Occasions, however, arise in which the President and Council may not be fully aware of the wishes and wants of the general body, wishes that they

would be very willing to give effect to, and wants that they would certainly wish to remedy. It may be urged that any member of this Institute can bring forward any motion in this room, and that the voting on such motions is a satisfactory indication of the general feeling on the matters in question; and to a limited extent this is so. But this leaves out the factor that great bulk of our members are resident in the provinces, and have frequently neither the time nor opportunity of attending to register their opinions on special points. Some question may crop up on which the provinces feel very keenly, but which only affects us here in a lesser degree, and the result of such a meeting may be decided in one way, whereas a poll of the whole body would indicate a very different feeling. It is a remedy for this state of things that I wish to bring about, and I think this remedy is one which will be beneficial alike to the general body of our members and to the Council itself. Criticism is a good thing in moderation, but possibly one may have too much of it; the Council, while doing its best for the profession, as I believe it always does to the utmost of its power, may yet be on the wrong track, and may be adversely and unreasonably criticised for what is only an error of judgment. My proposal enables the Council to put itself in the position of the clergyman who asks whether any just cause or impediment exists to two people being married, and on receiving no reply concludes the ceremony. If these powers are granted in the new Charter, it will be open to anyone who feels that a certain line ought to be taken on any professional point to get an expression of the wishes of the Institute on the subject. That such power will not be unreasonably or frequently used is amply provided for by my motion. It is practically impossible to get twenty-five signatures to a written requisition on any trivial point: it involves too much trouble and too much time and persuasion to do so. Alternative methods of obtaining the same result have been suggested, one being voting by proxy. While I should be glad to support this, failing the carrying of my resolution, I do not think it is so good or thorough a method as the one I suggest. If voting by proxy were admitted, it would be often possible for the mover of a resolution to obtain a large amount of support by writing a large number of letters to friends or by canvassing, and at the same time those holding opposite views and having an equal number of supporters might fail to prevent the carrying of a resolution against which a larger number of votes could be obtained by similar electioneering methods. My resolution aims at doing away with the necessity or possibility of electioneering. One does not want if a resolution is proposed to be dependent on whipping up support; one would only use the new powers for obtaining a perfectly impartial statement of the opinion of the members of the Institute, an opinion which I hope is, or soon will be, one and the same thing as the opinion of the great majority of the architects of this country. Once such a measure as I have suggested is incorporated in our Charter, there would, I believe, be a much greater feeling of confidence in and interest about the Institute. Power brings with a sense of responsibility, and with that sense of responsibility comes moderation. No one of us, whether living here or on the confines of the country, will be without our opportunity of swaying the policy of the Institute in the common interests of all architects, for it will be impossible to use such a poll in the interests of any section of members. And I am convinced that those who belong to the minority on any question will join loyally in supporting the policy of the majority after such a test of strength as I propose, and that the Institute will have an immensely greater power and influence in the future than it has ever possessed in the past. I accordingly move my resolution, “That a clause be inserted in the Revised By-laws empowering the taking of a poll on any professional question on the signed requisition of twenty-five members of the Institute.”

Mr. W. G. WILSON [F.] seconded the resolution. It was, he said, almost non-controversial in its character, and must appeal to everyone. Its object was to bring their meetings in London more into touch with the provinces; and speaking as a member who for many years was in the provinces he felt that some such means of having their vote recorded was absolutely essential if the Institute was to be made more homogeneous than it was at present. Only one possible objection he thought could be urged against this resolution—viz., that it might be used in a frivolous way, and the Institute be put to a great deal of trouble and expense. That, however, was perfectly safeguarded, inasmuch as the machinery for a poll could not be set in motion except on the requisition of twenty-five members. Anyone who knew anything about the matter would know that to get twenty-five signatures to a movement of this sort not only entailed a good deal of trouble, but it showed that there must be considerable feeling in the matter. The resolution was really more a matter for the provincial members. An Allied Society wishing to bring some matter before the general body of the Institute had not at present the means of doing so in an effective way. They would have to come to London at some expenditure of time and money, and at a great sacrifice of convenience; whereas if they could get up a requisition locally, and have the matter they wished ventilated brought to the test before the whole body of members, the result would be much more satisfactory, and certainly more equitable to all concerned.

THE PRESIDENT: This resolution, if carried, would mean the adoption of a new by-law.

Mr. WILLS: My proposal is that a new by-law to this effect should be inserted in the proposed Revised By-laws.

THE PRESIDENT having read By-law 61—viz.: “The adoption of any new by-law, or the alteration, suspension, or repeal of any existing by-law, may be proposed by the Council or by any twelve Fellows, &c.,”—said that in view of that by-law the resolution could only be brought forward as a recommendation for the Council to consider, as there had been no requisition of twelve Fellows as required by the by-law.

Mr. WILLS: But the vote of this Meeting if my resolution be passed will carry with it the fact that the general body considers it advisable.

THE PRESIDENT: I do not think this very small Meeting can be said to represent the whole body of the Institute.

Mr. R. J. ANGEL, M.Inst.C.E. [A.], speaking against the resolution, said that the reason for bringing it forward was connected with the resolution Mr. Wills had moved in that room three months ago, to the effect that it was inadvisable in the interests of architecture that public officials should carry out the designing of public buildings. The excuse for presenting the resolution was that some matter of interest to the Allied Societies or to architects in the provinces might be under consideration, and would not receive proper consideration in that room. That, however, was not the reason. The real reason was that if the resolution were passed, and a by-law was the result, a poll would be able to be taken on the subject he had already referred to.

Mr. H. H. STATHAM [F.]: Has the speaker any right to impute motives?

Mr. G. A. T. MIDDLETON [A.] said that, speaking on rather broader grounds, it seemed to him that if it were put as a recommendation to the Council it was a very reasonable resolution to pass. It wanted, however, a certain amount of safeguarding. It seemed quite reasonable, as they had the right of appealing to a poll if a motion were carried, that they should have a similar right of appeal to a poll in the case of a motion being rejected. It might be but a very small majority one way or the other. He did not think, however, that they should give the right of appeal to the poll unless the matter in question had been previously discussed in that room. The present safeguard

was a very wise one, that there should always be a preliminary discussion before a poll was taken. It was most necessary that all sides should be heard, otherwise they should have a small clique of twenty-five members suddenly pushing something forward, having already arranged amongst themselves a circular to go out putting an *ex parte* case before members, and rushing it through before the other side could possibly be heard. He thought it most essential that there should be something like a reasonable equation between the “fors” and “againsts” before a poll was demanded, and also that the thing should be properly discussed and a report of the discussion issued to those who were called upon to vote. On those grounds, and with those careful safeguards, it seemed to him quite right that they should be able to appeal to the whole of the members in the manner suggested.

THE PRESIDENT, replying to a question from Mr. H. HARDWICKE LANGSTON [A.], said that, as the resolution amounted to a recommendation for a new by-law, Associates would not be able to vote on the question under Clause 28 of the Charter.

THE SECRETARY, replying to a member, said that the approximate cost of a poll was about £16 or £17. There was also the time of the members who would be called upon to act as scrutineers.

Mr. GEORGE ELKINGTON [F.] asked if there was any objection to the proposal on the part of those in authority. They had heard so far only one side of the question. It would appear that the usual purpose of their meetings was to obtain the opinion and decision of members on questions which came before them, and what was now proposed was an extension of that same purpose. It was, it was stated, desirable to obtain the adhesion of provincial architects to the Institute, but it was not stated what efficient substitute there was at present for the attendance of provincial members at their meetings. It had often been said that the difficulty of getting to their meetings was one of the reasons why men in the farther parts of the country did not see much practical benefit from being members of the Institute. Therefore, unless there was some valid objection to the proposal, although they were only a small meeting that evening, he thought it was a question which the Fellows present, on whom was cast the duty of voting, should give support to without pledging themselves to any detail. If the motion were carried, although it represented only the opinion of a small number of the Fellows, yet, it being the decision of the Meeting, he presumed when it came before the Council the latter would see in what way it should be given practical effect to, with additional safeguards if necessary. He took it that any question of a poll to be issued to members generally would come from the Council, and that any individual members or body of men, however interested in the question they might be, would be prohibited from attempting to influence their professional brethren. The whole matter should come in the same way as if it were impartially put at a meeting. If that could be done he thought it would be a good thing, because anything that stimulated the interest taken in business matters by the profession generally tended to benefit the Institute.

Mr. W. H. D. CAPLE [F.], of Cardiff, said that as one of the provincial members present he should like to add a word or two in support of the resolution. He could assure the Meeting that there were many questions considered by the Institute from time to time upon which the opinion of large numbers of their provincial members were not at all in accord with the decisions arrived at in that room. The present proposal seemed to provide an excellent opportunity for provincial members all over the country to express their opinions on matters of importance. The measure proposed would not be taken except on a matter of vital interest, and on such a matter it would be of the utmost importance to get the widest possible expression of opinion. The provincial members formed a good proportion

of the total membership of the Institute, and they were entitled to the careful consideration of any means whereby an expression of opinion could be obtained on matters of importance. It seemed to him that the resolution before the Meeting provided an excellent opportunity of getting an expression of opinion when a motion was lost as well as when a motion was carried. He was quite sure that if such a recommendation to the Council were adopted, and if the Council in its turn would introduce a new by-law to give effect to the recommendation, they would have done a very great deal indeed to further the interests of the Institute and of the profession as a whole.

THE PRESIDENT said that if the resolution were put as a recommendation to the Council, he thought that it might very properly go forward in that form. He would remind Mr. Caple that the provinces were amply represented on the Council, and also that there were always business meetings when questions of the kind could be brought up. Again, questions of any importance to the profession were always first put before the Allied Societies. If a poll of the whole Institute had to be taken on any special question, they would have to issue, not only the papers for taking a poll, but an account of all that had been said for or against that special question. If a very important point was in question, he did not think it was a very great hardship for the country members to come up to London to vote upon it. Such questions certainly could not arise very often, and the London members would only be too pleased to see their provincial brethren present and voting upon any question that they thought affected them specially as country members. If Mr. Wills would put his resolution that it be a recommendation to the Council to consider it, he should be glad to put it to the Meeting.

Mr. WILLS : That it be a "strong" recommendation.

THE PRESIDENT : I put it in that form then : "That it be a strong recommendation to the Council in considering the revision of the By-laws to insert a clause empowering the taking of a poll on any professional question on the signed requisition of twenty-five members of the Institute."

The vote was then taken by show of hands. Fellows only voting, with the following result : For the motion, 12 ; against, 4.

THE PRESIDENT : The motion is carried, and the Council will, of course, consider the matter.

Architectural Development of Towns.

With reference to the resolution of Mr. Whitwell Wilson, M.P., in the House of Commons on the subject of the development of towns and their suburbs [JOURNAL, pp. 480-81], the Art Standing Committee have by resolution asked the Council of the Institute to appoint the strongest possible Committee to consider this subject.

Mr. John W. Simpson, Chairman of the Art Committee, has addressed the following letter to the Secretaries R.I.B.A. :—

GENTLEMEN,—With reference to the communication to the Council from the Art Standing Committee on this subject, my Committee have requested me to forward, with their recommendation, the following notes for the further confirmation of the Council.

The preparation of considered architectural schemes for the improvement and extension of cities was already under discussion by the Art Committee before the subject was raised in the House of Commons. The "cheerful acceptance"

of Mr. Whitwell's resolution by Mr. John Burns on behalf of the Government, his full admission of the necessity for legislation, and his statement that alternative Bills were already before him "to carry out what is immediately pressing," have, the Committee feel, now rendered the question one which should be brought to the notice of the Council without further delay.

That the preparation of such schemes must involve considerable self-sacrifice on the part of those who undertake it is certain ; but it is done in other countries for the public good and the advantage of art. In America plans and sketches illustrating the proposals of the artistic societies in a city are, I understand, prepared by them and presented to the public bodies concerned. The expenses, it would appear, are not very heavy, being mainly for draughtsmen's salaries and printing, the architects and others working gratuitously until and unless the scheme is carried into execution. The object is to arouse the public to interest in the beautifying of their cities and to indicate to the municipal authorities the lines on which improvements should proceed.

I would venture with deference to suggest to the Council that the Committee appointed should not in the first place be too large, and that its immediate purpose should be to consider the propriety of preparing schemes, and the necessary ways and means of doing so. It might, if the Council approve, be given power to add to its number men whose assistance and co-operation are deemed desirable.

With regard to London the task proposed is, of course, stupendous, but the time is ripe for a movement to be made. Sir Aston Webb, R.A., draws my attention to the fact that the Archbishop's speech at the recent Royal Academy Banquet was entirely devoted to this subject. The following passages in a letter to me are so admirably expressed that I have obtained the writer's permission to quote them in these notes for the Council.

"I can imagine," says Sir Aston Webb, "no more patriotic or magnificent task for the Institute to undertake, with the co-operation of kindred Societies, such as the Royal Academy, the Society of Arts, the Architectural Association, and others, than the preparation of a scheme along which the expansion and adornment of London may run. . . . I believe it would be possible with the hearty co-operation of many members to produce a scheme which would compel attention and ensure that any alteration and expansion of London in the future shall proceed on some definite and recognised scheme. There is no body more fitted for this task than the Royal Institute of British Architects, and it would be a splendid thing if after spending so much time on our own internal affairs we were now to devote some time to preparing a scheme for the improvement of the capital of our Great Empire."

Further on he speaks of "a great collective effort, led by the Royal Institute of British Architects,

endorsed by the whole artistic world in England if you will, and formally presented, as their contribution towards the beautification of London, to the Government and other authorities who hold the fate of future London in their hands."—I have the honour to remain, gentlemen, your obedient servant,

JOHN W. SIMPSON,
Chairman, Art Standing Committee.

Status of District Surveyors.

The following letter has been received from the London County Council with regard to the status of district surveyors for London :—

7th June 1907.

SIR,—In reply to your letter of the 30th ult. inquiring what action has been taken by the Building Act Committee of the Council as a result of the interview which the deputation from the Royal Institute of British Architects had with the Committee on 22nd April 1907, I am directed to state that the Committee do not see their way to recommending the Council to depart from its existing policy with regard to the appointment of district surveyors under the London Building Act, 1894, or to delaying further the filling up of the vacancies. In these circumstances, advertisements have been issued inviting applications for appointments on the conditions set out in the Council's standing orders, and the applications received will be considered in the course of next week.—I am, Sir, your obedient servant,

G. L. GOMME,
Clerk of the Council.

L.C.C. School of Building : Professor Pite's Lectures.

The series of six lectures on "The Ancient and Modern Architecture of London" now in course of delivery by Professor Beresford Pite [F.] at the L.C.C. School of Building, Ferndale Road, Brixton, form a concluding course to an annual series of Architectural History studies, and are arranged to follow the annual architectural examinations of the Board of Education. The lectures are open to all, and are largely attended. The following is the syllabus of the course :—

I. Westminster and the Abbey (delivered 23rd May).

II. Mediæval London—The Temple Church ; St. Bartholomew's, Smithfield ; Southwark Cathedral ; the Tower, &c. (30th May).

III. The Renaissance Churches of London, by Wren and his successors (6th June).

IV. Classical London — Somerset House ; Waterloo Bridge ; The National Gallery ; Euston Station, &c. (13th June).

V. (To be delivered 20th June) : The Gothic Revival—Houses of Parliament ; Law Courts ; Modern Churches.

VI. (To be delivered 27th June) : Recent Developments—Queen Anne Movement ; Original Style and Reaction ; Buildings now in Progress.

The subject of the Professor's annual July course of lectures for past students and teachers is "The

Renaissance Monuments in the Victoria and Albert Museum."

The Assuan Dam and Egyptian Antiquities.

The Society of Antiquaries publishes the report received from its representative in Egypt, Mr. Somers Clarke, with reference to the submersion of the Nile Valley and the measures to be taken by the Egyptian Government to minimise the danger which threatens the temples and remains of other monuments of architectural and archaeological interest in which that district abounds. Mr. Somers Clarke says :—

In January last I wrote from Egypt suggesting that the Society of Antiquaries should formulate a resolution and communicate it to the Egyptian Government in relation to the destruction which would overwhelm the antiquities in Nubia if the dam at Assuan be raised 23 feet above the present level; and to the undertaking which the Egyptian Government had given that the said antiquities should receive every consideration that was possible.

It cannot fail to interest the Fellows of the Society to know that our representations have not been in vain, and that the care already taken to maintain the remains on the island of Philae is to be extended to those temples and other places of archaeological and architectural interest which will be submerged when the enlarged reservoir is full.

In *The Times* of April 23 some extracts were given from a Parliamentary paper, known as "Egypt, No. 2, Despatch from the Earl of Cromer respecting the water supply of Egypt."

In justice to the Government of Egypt, it should be stated that these extracts do not by any means give an adequate account of the liberal and enlightened spirit in which the difficulties of the case are being met. Indeed, it might be supposed that around Philae alone was the fresh work of investigation to be centred. As a matter of fact, in order to avoid, if possible, the submersion of the antiquities, all parts of the valley between Assuan on the north and Khartum on the south were carefully examined by a commission, especially appointed for that purpose; the geological formation was studied, and the conformation of the valley observed with regard to the capacity (a) for the storage of a large body of water, (b) economy of construction, (c) materials at hand for such construction, (d) safety.

Having regard to the quantity of water that can be impounded with a wall of a given height, it is now proved that no place offers such conveniences as Assuan. Not less than £14,000 was voted for the investigation and necessary survey.

That which especially interests us is the following question : What steps will the Egyptian Government take to examine, survey, and to preserve, and, finally, to give to the world the results obtained? We must bear in mind that not only archaeology and architecture will suffer, but also ethnology, botany, and, indeed, nearly all kindred sciences.

The swamping of any part of the Nile Valley is, for us, its destruction.

The survey of that part of the valley which will be submerged has, to a considerable extent, been initiated during the examination already referred to.

An archaeological survey is to be taken in hand, no effort being spared to render this as complete and thorough as possible. In this survey will be included all temple and town sites, cemeteries, and all other indications of ancient civilisation. Plans of these will be prepared to a large scale.

Copies will be made of all inscriptions, whether on walls or rocks, beginning with those which will be first

submerged. The ancient cemeteries, &c., will be excavated and everything will be recorded.

The temples and other ancient buildings that can possibly be affected by the increased level of the water in the reservoir will be underpinned, fortified, and at the same time measured and drawn.

Lastly, the result of all investigations will be published to the world.

The sustentation of the temples will be undertaken by the Department of Antiquities, under M. Maspero. The rest of the work is placed in charge of Captain Lyons, R.E. Those who have the pleasure of knowing this gentleman are well aware of the admirable method, care, and thoroughness which he brings to bear on every work he undertakes.

The organisation of the great work is already begun. The Egyptian Government has voted £E 60,000 in order that it may be carried out in its integrity. We may be glad that the suggestion for pulling down and re-erecting on another site part of the ruins at Philæ has not been entertained.

Sir Aston Webb, R.A., at Cambridge.

Sir Aston Webb chose for the subject of his Rede Lecture, which was delivered in the Senate House at Cambridge last Saturday, "The Art of Architecture, and the Training required to practise it." Sir Aston pointed out that Architecture, though the mother of the Fine Arts, was yet the most neglected. To be satisfying, Architecture must be the indigenous expression of the people; and there was a present desire to discard archaeological methods, and start again with simple forms, thus following the example of Painting and Sculpture. A more elaborate system of training the architect was required now than formerly, owing to the fact that our traditions had been lost, and that buildings, both in their construction and arrangement, were more complicated than formerly. The modern training of an architect must include school and practical work; but before this he should have had a good general education, if possible at a public school and university. The lecturer urged that an understanding should be come to as to the part the various educational agencies should play in the training of an architect. The cause was a great one, for, with Literature, Architecture was the most permanent record of a nation's life. For some years now a rustling of the dry bones of Architecture had been heard, and a demand had arisen for a thorough reconsideration of our system, or want of system, in the training of architects. The lecturer regarded it as of the greatest moment that there should be a conference to determine the part which each of the educational bodies concerned were to play in the training of an architect, and he believed the great Universities could do much to help them.

The late Julius Alfred Chatwin [F.]

Mr. J. A. Chatwin, of Birmingham, *Fellow*, elected 1863, died on the 6th inst. in his seventy-eighth year. Mr. Chatwin was born at Birmingham, was educated at King Edward's School, and matriculated at London University. His architectural

education began in the office of Messrs. Branson & Gwyther, building contractors; but in 1851 he was articled to Sir Charles Barry, whom he assisted in the preparation of the drawings for the House of Lords. At this period Mr. Chatwin attended the evening classes of the first Schools of Design originated by the Prince Consort and held at the old Royal Academy rooms in Somerset House. On the termination of his articles he commenced practice in Birmingham. He early established a reputation for ecclesiastical work. He was architect of the new Church of St. Martin, Birmingham; restored and enlarged Aston Church; designed the chancel to St. Philip's, and afterwards acted as architect in connection with the alterations required to adapt that church as the cathedral church. He rebuilt or restored St. Augustine's, Edgbaston; the Catholic Apostolic Church, Spring Hill; St. Mary's, Acocks Green; St. Philip's, Knowle; St. Mary's, Warwick; St. Mary's, Kidderminster; Penkridge Parish Church, and many other churches. He enlarged St. George's, Edgbaston; and restored Edgbaston Old Church and Handsworth Parish Church. Of secular buildings he designed and carried out the Great Western Hotel in Colman Row; Lloyd's Bank in Lombard Street, London, and numerous provincial branches of that bank; the Wolverhampton Art Gallery, &c. He was architect to the Governors of King Edward's Foundation, and designed various grammar schools, &c.

Mr. Philip B. Chatwin, who was elected Fellow of the Institute last Monday, is a son of the deceased Fellow, and had been associated in partnership with him for several years.

REVIEWS.

PRINCIPLES OF DESIGN.

The Principles of Architectural Design. By Percy L. Marks, Author of "*The Principles of Planning*," 8o. Lond. 1907. Price 10s. 6d. net. [Swan Sonnenschein & Co., 25 High Street, Bloomsbury.]

It would, perhaps, be too much to expect of the writer of this book that he should have any new discovery of principle to enunciate; but what may with reason be looked for by a reading public in a work of so ambitious a title will without doubt be some added clearness of demonstration, some more helpful and concrete application of principles already established, which shall enable the student more easily to bring his own intuitions into tangible form.

To every architectural student interested in his art there arrives, sooner or later, an intellectual apprehension of certain philosophic principles which underlie good design; but to each one the revelation is limited in the first place by his own mental capacity or "personal equation," in the second place by an absence of the necessary links

in his consciousness by which he can transform the ideal into the actual and crystallise his intuitions into practical form. This power, which is the architect's desideratum, must come as the result of effort and experience; for it is experience alone which can truly vitalise these principles to him, making them living and active in his consciousness.

To convey to the student's mind any real or vital perception of architectural principle, such as can in any sufficient degree take the place of the missing factor of practical experience, is no easy task, and to successfully essay this must demand, in the first place, on the part of the author of a work of this kind an adequate grasp of the genuine philosophic bases of design, and a full power to apply them in a lucid and convincing manner. Much, for this purpose, would depend upon the nature of the applications given. A wide and catholic experience of his own in architectural practice would likewise be essential if the writer is to offer that certain and practical help which the reader will be seeking.

But what have we here? The first glance within the cover, with its high-sounding title, reveals a list of the qualities which are involved in the make-up of every architectural work; these are the author's principles. Next follow chapters in which these are in turn discussed, and the author elaborates his views upon them with homely applications.

Under the head of "Expression," "Emphasis of Plan," "Scale," and "Economy," the reader is instructed (very properly, no doubt) to make a building bespeak its purpose, and is taught, for instance, how to recognise a school building when he sees it—nay, more, how to differentiate between a private school and one that is rate-supported.

Contrary to anticipation, we are told that it is in the latter that we should strive for a "plain, serviceable structure."

From schools we are taken to warehouses, and here points of contrast are offered for the uninitiated, as, *e.g.*, "a factory would be even more simply treated than a Board school: it would have a greater number of windows proportionately, and they would be disposed symmetrically for economy and convenience; by preference they would be iron casements (a Board school might have sash-windows)," &c.

Westminster Palace Hotel and the Market House, Bolton, are illustrated as "instances of successful expression," while the use of the classic type connoting a sacred temple for the purpose of a secular hall, such as St. George's Hall, Liverpool, is reprobated. A glance at some of the woodcuts inspires an heretic doubt as to whether the virtuous course of candid expression advised by the author is really its own reward. Certainly we may agree that the chaste front of the Vestry Hall of Paddington (fig. 9) is more to be desired than the "inexpressive" substitute designed by the

author (fig. 10), which is like nothing on earth. But if the elevation of a villa given in fig. 12 is to be regarded as a successful expression of the plan, we may pray that the plan in question may not be adopted in our generation.

In fig. 13 is, again, the author's "inexpressive" substitute. This not merely fails to express the plan, but it fails also to express rationality in construction, inasmuch as a straight roof is placed over the whole front, oblivious of all differences in projection, which, as the plan shows, are important. Consequently the "inexpressive" roof overhangs the front wall at one end by eight feet or so!

Under "Economy" a façade is offered (fig. 14) for a group of terrace houses in London. The name of the architect is (perhaps fortunately) unknown, so that he cannot suffer the painful immortality which so many others are called upon to endure in this work. Incidentally, it is interesting to note that the façade "allows much to be said in its favour."* A concluding word about "Economy" shows how the author knows how to unbend from his consideration of the abstract, and it must be with gratitude for his condescension that the student will accept the following:—

"Economy is often obtained by the exercise of the architect's up-to-date knowledge of goods on the market. It may be a useful hint to advocate personal interviews with all travellers and the careful perusal (not necessarily an intimate knowledge) of the trade catalogues forwarded."

In his chapter upon the "Consideration of Roofs and Sections," Mr. Marks warns his readers not to make their roofs of a pitch different from their gables, and, if they adopt parapets, by no means to make them so high that they look like a second storey; for, he tells us, "such an expedient as that adopted by Sir Christopher Wren at St. Paul's Cathedral is to be condemned utterly."

It is comforting to reflect that the opportunity of repeating such an error will probably be lacking to most young architects.

Next a plan is offered, with large blocks or pavilions projecting from the angles of a square, and a diagram is given showing the ill-effect of a pyramid roof dumped over the whole—an impossibility, by the way, having regard to the plan—but we are solemnly told that this (fig. 18) would be aesthetically incorrect and wanting in emphasis. As to the want of emphasis, especially about the eaves, there might be two opinions.

In the chapter on Proportion, Balance, and Symmetry—headed by a singularly disagreeable illustration—we are treated to lucubrations about the

* Plate VIII. is given as an instance of the contention that economy is not necessarily productive of poverty of design. In it are shown two pairs of semi-detached villas: the pair on the right-hand, so far from giving point to the author's contention, present perhaps as glaring an instance of crudity of design, and the fatal effect of municipal by-laws in regard to party-walls, as could be found in a complete tour of the London suburbs.

animal figure, and a good deal of quite inconclusive reference to the numerical bases of proportion, a recital of Gwilt's and Pugin's principles or rules being added to give substance to the chapter.

As an illustration of "want of balance" the same hideous villa shown in fig. 12 is again put forward in fig. 27, with a slight exchange of features; but a comparison of the two conveys little, as they are both impossible in their ugliness.

In the following chapter the old, old theme of "unity with variety" is trotted out. The Natural History Museum is illustrated as a fine example of the union of these principles. A long extract from the pages of a bygone number of the *Architect* provides the author with a large proportion of his material.

Two plates are given illustrating the original and amended designs for a "small country-house" by the author (Plates XI. and XII.), in regard to which we are told that, whereas "the first, though well-balanced, lacks unity of design," the second "is free from the defects shown in the former."

There is certainly enough and to spare of the principles of variety, even in the amended design, for a more extraordinary medley of features was surely never seen than is visible in this fussy and pretentious pile, which combines the high-pitched roofs of the French château with the arabesque of Flanders, chimney breasts ending, not in stacks, but in pedestals capped, well below the roofs, by Greek pediments, with Italian arcades to the loggia and pilaster buttresses having pinnacles of Gothic form, to set off the angles of the building!

On page 69 the author enters into the question of developing a design, and offers first, as the *corpus vile* for his experiment, a "severely practical elevation" (fig. 37), which he proceeds to elaborate in fig. 38, destroying in the process its one dubious merit, that of simplicity, and offering in exchange an effect entirely unsightly and disproportionate.

In fig. 41 this is "more fully developed" into the most hopeless piece of architectural vulgarity which could well be conceived.

The chapter following, pedantically entitled "fenestration and portalage," consists of nothing more than architectural "small-talk," and this applies to most of the remainder. The large plates of diagrams of windows, doors, &c., are simply an *omnium gatherum* of all sorts and kinds; on the same page are domestic, commercial, and ecclesiastical windows, jumbled together without order or classification, a traceried light from Canterbury Cathedral set side by side with a modern sash-window of the speculative builder's type, &c., the whole being a totally unmeaning collection, without relevance to the text.*

The illustrations throughout the book are inept,

* The author explains their insertion (page 95) on the ground that "an inch of illustration is often as valuable as a yard of text."

the draughtsmanship slovenly and clumsy, except where, in a few cases, the drawings are borrowed.

Pages 108-122 are taken up with lists of "Signs and Symbols" for use in architectural ornament, among which the author thinks it worth while to offer such instances as:

Balls :	three golden	Pawnbroker (illustrated).
Black (pigment)	.	Mourning.
Combs	.	Hairdresser, &c.
Cow	.	Dairies.
Flag (stars and stripes)	.	United States. &c., &c.

The symbols of the various saints make useful filling, in extended order, for two pages.

The whole of Plate XXIII. (double page) is devoted to illustrations of symbols, among which we observe such recondite instances as the Royal Arms, the English halfpenny, the florin, the Union Jack, &c.

It were profitless as well as tedious to pursue further the review of a work which it is scarcely possible to criticise seriously. Chapter follows chapter of wordy and windy talk—"wise saws and modern instances"—the setting-up of the proverbial argumentative "man of straw" and the knocking of him down again. Enough has been said of a work whose futility is in very slight measure redeemed by the rare occurrence in its pages of some hints of minor experience and suggestions which concern the planning and fitting-up of rooms—a domain in which the author is perhaps more at home than in the high region of architectural principles.—FREDK. BLIGH BOND.

CROSBY HALL.

THE threatened demolition of Crosby Hall fills us with the spirit of unrest. A few notes, perhaps, at this time will not be out of place.

This is not the first time the Hall has passed through troublous times. It barely escaped the Great Fire of 1666, and another which took place in 1672 destroyed a large part of the house; but happily the Hall escaped on both occasions without material injury.

The interest of Crosby Hall is historical as well as architectural. It was built by Sir John Crosby, or Crosbie, grocer, in 1466, on land leased from Saint Helen's Nunnery, which adjoined the church. The doorway to the Nunnery can still be seen on the north side of the church. Sir John Crosby was one of the sheriffs of the City and an alderman in the year 1470: he was knighted by Edward IV. in 1471. Sir John also held the office of Mayor of the Staple of Calais, was a representative in Parliament for the City in the year 1461, and was Warden of his Company. He never attained the dignity of Lord Mayor, and died in the year 1475. He was buried in St. Helen's Church, and a fine monument to him and his lady is raised there.

In 1483 the Hall was occupied by Richard III.,

and it is twice mentioned by Shakespeare in his *Richard III.*

Sir John Moore, the author of *Utopia*, lived here about 1518. Later the property passed by purchase to Alderman William Bond (died 1576), a merchant adventurer, and, according to the inscription on his tomb in St. Helen's, "the most famous in his age." At this time, and later, it seems to have been the custom to lodge the ambassadors here. The Spanish and the Danish Ambassadors were sumptuously lodged in Crosby Place. The Due de Sully was here in 1594, the Due de Boron in 1601, and the Russian Ambassador in 1618.

In 1594 Sir John Spencer, an ancestor of the Marquis of Northampton, lived at the Hall during his mayoralty, and a beautiful monument to his memory is to be seen in St. Helen's Church. Shakespeare was living close by in 1598, and was rated in the parish books. The Hall was afterwards the residence of Spencer, Earl of Northampton. In 1638 it was "held by the East India Company and valued at £100 per annum." During the Great Rebellion it was occupied by Sir John Langham, and for a while Royalist prisoners were kept there in custody, Sir Kenelm Digby being one of these.

In 1672 the Hall was converted into a Nonconformist meeting-house, and continued to be so used for about a century. From 1810 to 1831 it was leased to a firm of packers, who divided it into floors and greatly damaged the building. On the lease running out public attention was roused, a fund was raised, and the interior was carefully restored and reopened by the Lord Mayor, Alderman W. J. Copeland, M.P., in July 1842.

In 1842 the Hall was leased to the Crosby Hall Literary Institute; but this came to an end in 1860, and for seven years the old Hall served as a wine merchant's warehouse. Since 1868 it has been a restaurant.

The matchless open roof is decidedly one of the finest specimens of timber work in existence. The Hall possesses a beautiful oriel window. There are also considerable brick cellars.

Is it not time that the Government took over custody of our ancient buildings? It can hardly be possible that the City authorities will allow such a unique building to be demolished. Would it not make an admirable museum for London treasures now somewhat crowded in the Guildhall?—or perhaps our City Companies which have no hall of their own might combine and save for all time this grand old merchant's town-house of the fifteenth century.

W. ARTHUR WEBB [A.]

* * * *The Builder* of last week, in a note on Crosby Hall, says that the gabled front in the main street is modern work, having been built, it is believed, by Wilkinson; the terra-cotta figure of Sir John Crosby by Nixon, and executed by Messrs. Doulton, was set up about seventy years ago. The coloured glass in the oriel of the great hall

is by Thomas Willement, who presented it at the time (1836–42) of the restoration of the fabric by Blore. In 1816 the owner removed nearly all the decoration of the council-chamber to his dairy at Fawley Court, Bucks; the finely coved ceiling, with the roof and louvre, became the property of Mr. Yarnold, of Great St. Helen's, and at the sale of his collection in 1825 those relics were bought by Cottingham for his museum in Waterloo Row, Lambeth. The inner roof of the great hall is an elaborate specimen of timber work of the period (1466–75). Ornamented pendants hang from the points of intersection of low-pointed arches, the spandrels being pierced with trefoil-headed openings. The principal timbers are carved with flowers and foliage in a hollow, and the whole springs from octangular stone corbels on the piers between the windows. The oriel of the hall is vaulted in stone and beautifully groined, having ribs that spring from angle pillars with bosses and foliage at the points of intersection.

It is stated that pressure is being brought to bear on the London County Council to take some action to save the building. This the Council can do under its General Powers Act of 1898, which authorises the Council to purchase buildings and places of historical interest, or to undertake or contribute towards the cost of their preservation.—ED.

MINUTES. XVI.

At the Fifteenth General Meeting (Business) of the Session 1906–07, held Monday, 10th June 1907, at 8 p.m.—Present : Mr. Thomas E. Colleutt, President, in the Chair; 16 Fellows (including 5 members of the Council), 17 Associates (including 1 member of the Council), the Minutes of the Special General Meeting held Tuesday, 28th May [p. 512], were taken as read and signed as correct.

The Hon. Secretary announced the decease of Julius Alfred Chatwin (Birmingham), Fellow.

The Hon. Secretary drew attention to a list of works recently presented to the Library [see *Supplement*], and proposed a vote of thanks to the donors, which was passed by acclamation.

The Secretary announced the results of the polling for the election of the Council and Standing Committees for the official year 1907–8 as reported by the Scrutineers—viz.

PRESIDENT.—Thomas E. Colleutt [*unopposed*].

VICE-PRESIDENTS.—James S. Gibson, Edwin T. Hall,

Henry T. Hale, Leonard Stokes [*unopposed*].

HONORARY SECRETARY.—Alexander Graham [*unopposed*].

MEMBERS OF COUNCIL (18).

Elected : E. Guy Dawber, 557 votes; Ernest Newton, 547; Ernest George, 536; Reginald Blomfield, 524; John Slater, 506; A. N. Prentice, 490; J. J. Burnet, 483; J. A. Gotch, 479; H. V. Lanchester, 475; John W. Simpson, 454; A. W. S. Cross, 446; Paul Waterhouse, 439; E. A. Gruening, 433; E. Lutyens, 426; W. A. Pite, 420; Hulsey Ricardo, 420; C. E. Mallows, 401; Wm. Flockhart, 394.

Not elected : G. H. Fellowes Prynne, 385 votes; W. D. Caroe, 382; George Hubbard, 369; R. S. Balfour, 359; Sir A. Brunwell Thomas, 339; Maurice B. Adams, 300; Edmund Wimperis, 274; Temple Moore, 269; W. A. Forsyth, 261; W. H. Atkin Berry, 256; R. Selden Wormum, 234; A. R. Jemmett, 123.

ASSOCIATE MEMBERS OF COUNCIL (4).

Elected: Sidney K. Greenslade, 486 votes; H. A. Crouch, 415; W. Curtis Green, 370; Stanley Hamp, 307.

Not elected: H. W. Wills, 303 votes; J. Humphreys Jones, 212; C. E. Hutchinson, 216; K. Gammell, 146; Frank Lishman, 113.

REPRESENTATIVES OF ALLIED SOCIETIES (9).

Elected: Edmund Kirby (Liverpool), 557 votes; H. D. Bryan (Bristol), 549; H. S. Chorley (Leeds and Yorkshire), 543; W. M. Mitchell (Ireland), 524; Hippolyte J. Blane (Edinburgh), 517; J. M. Monro (Glasgow), 498; Paul Ogden (Manchester), 485; A. B. Plummer (Northern), 449; J. F. Groves (Cardiff), 379.

Not elected: Howard H. Thomson (Leicester), 371 votes; W. Carter Fenton (Sheffield), 366; J. Donald Mills (Dundee), 328.

REPRESENTATIVE OF THE ARCHITECTURAL ASSOCIATION.—Walter Cave (*unopposed*).

HON. AUDITORS.—H. P. Burke-Downing [F.]; A. W. Sheppard [A.] (*unopposed*).

ART STANDING COMMITTEE.

Fellows (10).—*Elected*: Ernest George, 547 votes; H. T. Hare, 540; E. Guy Dawber, 509; J. S. Gibson, 468; E. S. Prior, 466; W. R. Eethaby, 465; J. J. Burnet, 437; John W. Simpson, 417; R. S. Balfour, 380; Paul Waterhouse, 380.

Not elected: William Flockhart, 379 votes; E. A. Rickards, 377; J. Macvear Anderson, 374; W. D. Caroe, 316; W. A. Forsyth, 315; W. G. Wilson, 113.

Associates (6).—*Elected*: S. K. Greenslade, 536 votes; T. G. Lucas, 485; A. T. Bolton, 403; T. Davison, 391; J. Anderson, 388; Edgar Wood, 386.

Not elected: Stanley Hamp, 369 votes; W. J. Tapper, 354; S. Warwick, 306.

LITERATURE STANDING COMMITTEE.

Fellows (10).—*Elected*: R. P. Spiers, 526 votes; J. A. Gotch, 514; Professor F. M. Simpson, 475; Paul Waterhouse, 412; E. S. Prior, 438; Hugh Stannus, 430; A. W. S. Cross, 382; Halsey Ricardo, 374; Professor R. Elsey Smith, 374; C. Harrison Townsend, 333.

Not elected: P. S. Worthington, 311 votes; John Bilson, 290; G. H. Fellowes Prynne, 288; A. B. Jackson, 247; W. A. Forsyth, 246; Henri Favarger, 211; Francis Hooper, 193; H. A. Satchell, 103; A. T. Taylor, 92; Harry Sirr, 77.

Associates (6).—*Elected*: W. H. Ward, 512 votes; P. L. Waterhouse, 486; W. Curtis Green, 426; J. Humphreys Jones, 418; A. J. Stratton, 376; H. Passmore, 330.

Not elected: Frank Lishman, 266 votes; F. Chatterton, 224; B. Walker, 193; C. E. Sayer, 187.

PRACTICE STANDING COMMITTEE.

Fellows (10).—*Elected*: Max Clarke, 490 votes; A. Saxon Snell, 480; T. H. Watson, 474; W. H. Atkin Berry, 474; A. W. S. Cross, 474; George Hubbard, 472; J. Douglass Mathews, 462; W. H. White, 430; Sydney Perks, 392; H. A. Satchell, 380.

Not elected: John Murray, 377 votes; Ernest Flint, 362; Arthur Crow, 316; Charles Reilly, 308; A. H. Kersey, 260.

Associates (6).—*Elected*: A. W. Tanner, 497 votes; Horatio Porter, 488; T. E. Pryce, 463; E. R. Hewitt, 415; Edward Greenop, 434; H. H. Langston, 417.

Not elected: W. C. Waymouth, 404; R. S. Wilkinson, 395.

SCIENCE STANDING COMMITTEE.

Fellows (10).—*Elected*: H. D. Searles-Wood, 499 votes; Max Clarke, 437; H. Percy Adams, 437; C. Stanley Peach, 407; A. Saxon Snell, 402; Matt. Garbutt, 387; Lewis Solomon, 360; Wm. Dunn, 357; T. W. Aldwinckle, 356; Francis Hooper, 346.

Not elected.—Bernard Dicksee, 322 votes; Sydney Perks, 322; Ernest Flint, 287; G. Hornblower, 258; W. E. V. Crompton, 247; A. J. Gale, 231; A. W. Moore, 203; F. Hammond, 169; W. Pywell, 122.

Associates (6).—*Elected*: H. W. Burrows, 566 votes; R. J. Angel, 534; E. R. Hewitt, 516; E. J. Bennett, 493; E. W. M. Wonnacott, 485; E. A. Young, 467.

Not elected.—W. Jaques, 437.

The President declared the Officers, Council, and Committees duly elected in accordance with the Scrutineers' Report; and a vote of thanks to the Scrutineers for their services was passed by acclamation.

The following candidates for membership were elected by show of hands under By-law 9:—

AS FELLOWS (20)

OTIS DUDLEY BLACK (Liverpool).

ALBERT THOMAS BUTLER (Cradley Heath).

SIDNEY BURGOYNE CAULFIELD.

PHILIP BOUGHTON CHATWIN (Birmingham).

PERCY HEYLYN CURREY (Derby).

FRANK BROOKHOUSE DUNKERLEY [A.] (Manchester).

NICHOLAS FITZSIMONS [A.] (Belfast).

DAVID THEODORE FYFE.

LESLIE WILLIAM GREEN [A.].

JOHN HARTREE (Hereford).

HUGH TAYLOR DECEIMUS HEDLEY (Sunderland).

WILLIAM MURTHWAIT HOW.

PHILIP MAINWARING JOHNSTON.

WALTER SCOTT DEAKIN (Shrewsbury).

WILLIE SWINTON SKINNER (Bristol).

WILLIAM STEWART.

HENRY TANNER, Jun. [A.].

JOHN ALICK THOMAS.

HERBERT TOOLEY [A.].

ROBERT MAGILL YOUNG, B.A. (Belfast).

AS ASSOCIATES (5).

THOMAS CHARLES AGUTTER [Qualified 1892] (Ipswich).

SAMUEL CHARLES BRITTINGHAM [Qualified Colonial Exam. 1906] (Melbourne, Australia).

WALTER HOOKER [Qualified 1886].

KENNETH GUSCOTTE REA [Qual. Colonial Exam. 1906] (Montreal, Canada).

STANLEY JOHN WEARING [Probationer 1903, Student 1905, Qualified 1906] (Leicester).

Mr. Herbert W. Wills [A.] in accordance with notice, moved that a clause be inserted in the Revised By-laws empowering the taking of a poll on any professional question on the signed requisition of twenty-five members of the Institute.

Mr. W. G. Wilson [F.] having seconded the resolution, the President pointed out that, under By-law 61, the adoption of a new by-law must be proposed by the Council or by twelve Fellows, and that therefore the resolution could only take the form of a recommendation to the Council to consider the advisability of introducing a new by-law for the purpose suggested.

The resolution having been discussed, the President's proposal that it should go to the Council as a recommendation from that Meeting was agreed to, and the motion was put from the Chair in the following form: "That it be a strong recommendation to the Council in considering the revision of the By-laws to insert a clause empowering the taking of a poll on any professional question on the signed requisition of twenty-five members of the Institute."

Upon a show of hands, Fellows only voting as provided by Clause 28 of the Charter, the motion was carried—12 voting for and 4 against it.

The proceedings then closed, and the Meeting separated at 9.15 p.m.

